THE IRON TRADE REVIEW

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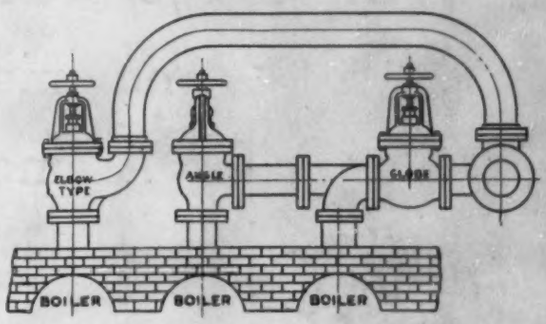

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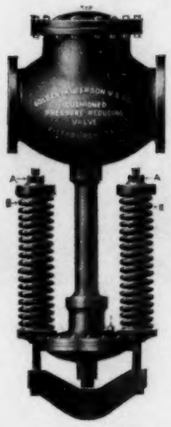

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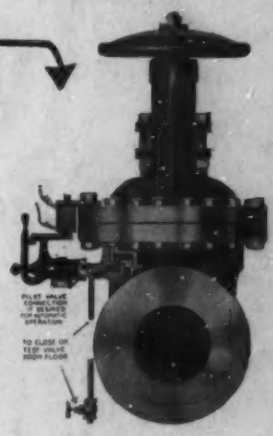

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Say you saw it in THE IRON TRADE REVIEW

THE IRON TRADE REVIEW

Vol. LVIII Cleveland, April 13, 1916 *No. 15*

Record Breaking Sales of Pig Iron

Made Last Month by Northern Merchant Furnaces—Railroads Anxious to Buy Rails Before Price is Advanced

MARCH made the greatest record in the history of the iron trade in the sale of northern iron by merchant furnaces. Careful investigation has developed that the sales aggregated more than a million tons, a monthly total never before equaled. The demand was not for any particular grade, but included all kinds of pig iron. Probably 90 per cent was for delivery this year. Although sales for delivery into next year are slowly increasing, neither furnaces nor melters are anxious at the present time to make contracts extending beyond Jan. 1, 1917. It was not to be expected that after the tremendous buying of last month, there would be as large a volume of business this month, but there has been considerable activity, especially in Chicago and Cleveland. One Cleveland firm has sold more than 40,000 tons this month. The French government, through J. P. Morgan & Co., has asked American pig iron sellers to quote on as large a tonnage of bessemer pig iron as they will be able to supply. The sale to the Youngstown Sheet & Tube Co. of the properties of the Andrews & Hitchcock Iron Co., Hubbard, O., including two blast furnaces and very valuable ore and coal deposits, marks another step in the wonderful progress of the Youngstown concern and removes one of the most important pig iron producing firms in the valleys from the competitive field. Eastern Ohio and Western Pennsylvania manufacturers are quietly negotiating for a heavy tonnage of steel-making grades. Inquiries involve fully 100,000 tons. Steel companies appear anxious to buy heavy tonnages, but not much iron is available for nearby equipment.

Structural Material

Present high prices of structural material and the sold-up condition of mills are making it difficult for many fabricating shops to obtain material on a basis at which they can take contracts, but the tonnage booked by the shops during March was considerably heavier than in either February or January. It amounted to about 175,000 tons, compared with 129,000 in February and 119,000 tons in January. This tonnage did not include the awards made to the American Bridge Co. for new plant construction, for subsidiaries of the Steel Corporation. The lifting by the New Haven railroad of its embargo on structural material shipments into New England has relieved the situation in that section. Fabricating prices are advancing and $85, erected, is a common figure in eastern territory.

Railroad Buying

In view of the expected advance in the price of steel rails, there is very active inquiry from the railroad companies and some are endeavoring to buy for delivery as far as 1918. The Corporation will, however, not sell beyond May 1, 1917, and the independents continue to make rail sales for the first half of next year only. The Southern railway has closed for 2,500 box cars and the Erie has ordered 500 gondolas additional.

Foreign Orders

Inquiries for tremendous tonnages of shell steel for delivery in the last half of the year continue to appear. One foreign government has just sent out an inquiry for 100,000 tons of rounds and another for 60,000 to 70,000. A domestic shellmaker is in the market for 20,000 to 30,000 tons of steel. The Italian State railways have sent out a new inquiry for 30,000 tons of rails.

Bars

A leading independent company will make contracts for steel bars with agricultural implement manufacturers at 2.25c, Pittsburgh, for six months, to the extent of half of their last year's requirements, but some other companies will not sell these buyers at less than the prevailing price made to other consumers. Many agricultural implement concerns have already contracted at 2.25c, and some were fortunate enough to get in at 1.90c.

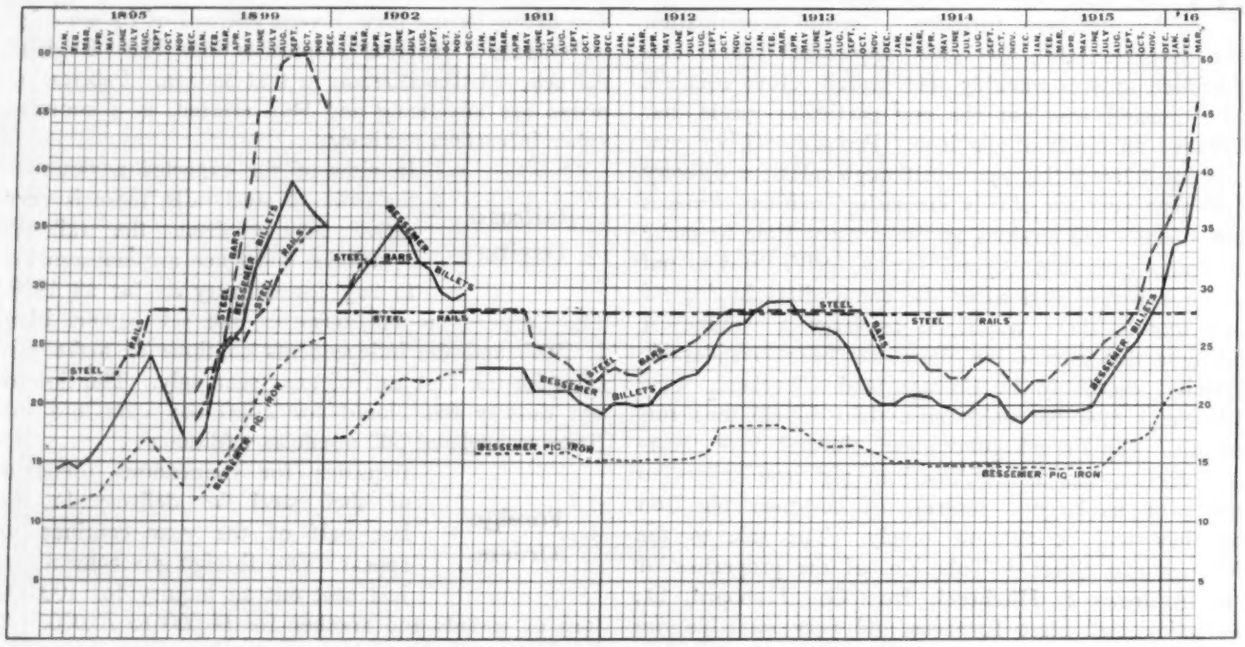
Coke and Scrap

Standing out in striking contrast with the strength in other materials, furnace coke has developed weakness on account of the heavy production and improvement in shipments. Scrap has also developed weakness in some centers.

THE OPEN HEARTH

A Wise Change of Policy

AFTER being in a class by themselves since May, 1901, steel rails are to be like other products; that is, after being quoted on an unvarying basis of $28 for 15 years, prices are to be determined, as they are in other products, by market conditions. We believe that this change of policy is wise, especially because it removes the last vestige of the old time method of controlling prices by various kinds of agreements. Although in recent years there has been no agreement as to prices of steel rails, the old price of $28 has simply been allowed to stand by common consent, because all concerned were fairly well satisfied with it. This could not continue always and it was hard to convince those not familiar with actual conditions that the straight line on the chart, showing the same price of steel rails as prevailed in the days of agreement, did not indicate some kind of illegal proceedings.



PRICES OF BESSEMER STEEL RAILS AND OTHER PRODUCTS IN 1895, 1899, 1902 AND 1911 TO APRIL, 1916, ALL AT PITTSBURGH

In order to show the relative prices of bessemer steel rails as compared with bessemer pig iron, billets and bars, a chart is herewith presented. In this chart, as in the one which was published last week, three early years of high prices are presented, as well as the past five years and the past three months. It will be observed that in 1895 the price for six months was $22, and after advancing to $24 in July and August, the price was held at $28 for the remainder of the year. The average price for the year was $24.33. The $28 price continued during 1896, but it dropped to $25 in January, 1897, to $20 in February, and in March, an $18 price was named and was adhered to until June, 1898, when that quotation was shaded 50 cents. The average price for 1898 was $17.62. In 1899, the price started at $18.50 and steadily advanced until $35 was quoted in November and December. The average price for the year was $28.12. The average price for 1900 was $32.29. In 1901, $26 was the price during the first four months, but in May, $28 was established and has continued ever since. The tendency through all these years has been for billets and bars to sell at considerably lower prices than rails. In 1895, rails were higher than billets, but in 1899, the year of sensationally high prices, billets climbed to $4 per ton higher than rails and bars $15 higher. In the boom of 1902, the highest points of bars and billets were $4 and $7, respectively, above the $28 price of rails. In the sagging market periods of 1911, 1912, 1913 and 1914, bars and billets were far below rails for many months and it is not until late in 1915 that the curves representing bars and billets cross the straight line showing the $28 price of rails. Today we have the remarkable condition of bessemer billets selling at $17 more than rails. This fact is so entirely out of harmony with general conditions that a revision of steel rail prices is imperative.

Changes which have taken place during the past 15 years, resulting in the higher costs of raw material, have, of course, affected rails as well as other finished

THE OPEN HEARTH

materials. The accompanying table, giving quotations for May 30, 1901, and April 12, 1916, shows advances in all products, including some which do not enter into the manufacture of rails. Old range bessemer ore is only 20 cents a ton higher now than it was in May, 1901, but bessemer pig iron has advanced $5.45 a ton, bessemer billets $20, spikes $15 and track bolts $18. Although the very rapid advance in the price of ferro-manganese since the European war was declared is a factor in the cost of making rails, it is, of course, true that railmakers are not making rails with ferro-manganese which cost $175 per ton. An interesting feature of the table is shown in the price of light rails, which have advanced from $37 to $44, while heavy rails remain stationary. The higher wages paid to workingmen is also a very important feature.

As to the price of rails for delivery after May 1, 1917, it is understood that nothing has been determined. A substantial advance will probably be announced, and, in future years, there is likely to be considerable irregularity in quotations.

PRICES OF IRON ORE AND FINISHED MATERIALS, PITTSBURGH, 1901-1916.

	Bess. pig.	Bess. billets.	Ferro, Balto.	Spelter, St. Louis.	Light rails 12 lbs.	Plates.	Spikes.	Track bolts.	Bars.	Shapes.	Wire nails.	Bess. ore old range.
May 30, 1901	$16.50	$25.00	$58.50	$78.00	$37.00	$32.00	$40.00	$52.00	$28.00	$32.00	$46.00	$4.25
Apr. 12, 1916	21.95	45.00	175.00	360.00	44.00	55.00	55.00	70.00	50.00	50.00	48.00	4.45
Advance	5.45	20.00	116.50	282.00	7.00	23.00	15.00	18.00	22.00	18.00	2.00	0.20

Have you written to your congressman, telling him what you think about the armor plate bill? If not, do it today. The bill has not yet passed the house and, although the administration is making every effort to jam it through, its defeat is still a possibility.

A Solid Foundation

A WONDERFUL example of the ability of Germany to carry on its industries in time of war is furnished by the record of steel production since the hostilities were started. As shown by the accompanying chart, steel production has increased in nearly every month since August, 1914. The figures of production have been as follows, in metric tons:

August, 1914	567,610
September	660,615
October	900,227
November	892,814
December	928,294
January, 1916	963,790
February	946,191
March	1,098,311
April	1,012,824
May	1,044,107
June	1,080,786
July	1,138,651
August	1,158,702
September	1,174,350
October	1,215,287
November	1,192,817
December	1,165,465
January, 1916	1,224,732

What is the secret of this wonderful result? We believe that Hon. John H. Clarke, judge of the United States district court in the Cleveland district, was right when a few days ago he said in a speech that the great secret of Germany's success lies in the fact that she has contented working people. The judge said that he would not recommend the adoption in the United States of the methods of dealing with workingmen followed in Germany, which are better fitted for a autocracy than for a democracy, but he expressed confidence that the people of this great country are resourceful enough to devise means of making this the best country on the face of the globe. Make the people happy and devoted to their country and in that way lay the foundation for real preparedness. The judge conceded, of course, that the government must meet present conditions by providing all that is necessary to carry on war, but, at the same time, the importance of the real foundation of patriotism and industrial progress must never be forgotten. The distinguished jurist speaks from experience, for he lived many years in Youngstown. The truths which he propounded cannot be too frequently driven home.

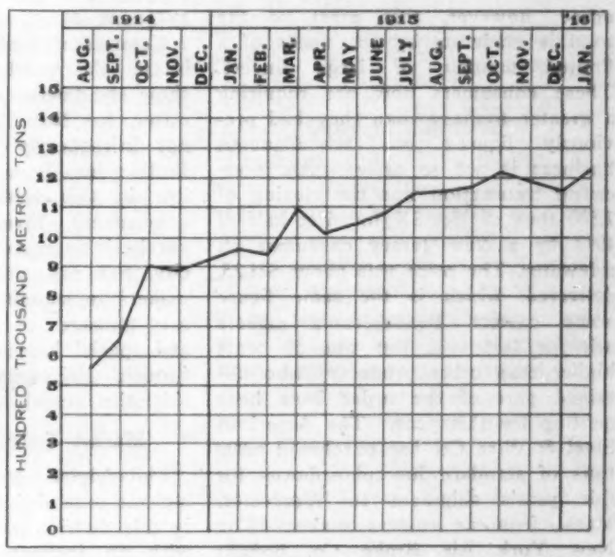


CHART SHOWING PRODUCTION OF STEEL IN GERMANY SINCE WAR WAS DECLARED

Prices Present and Past

(Yesterday, a month ago, three months ago and a year ago.)

Quotations on leading products April 12, average for March, 1916, average for January, 1916, and average for April, 1915. Prices are those ruling in the largest percentage of sales at the dates named.

	Prices Apr. 12, 1916.	Aver. for Mar., 1916.	Average for Jan., 1916.	Aver. for April, 1915.
Bessemer pig iron, Pittsburgh	$21.95	$21.55	$21.32	$14.55
Basic pig iron, Pittsburgh	19.20	19.20	19.20	13.45
No. 2 Fdy. pig iron, Pittsburgh	19.70	19.45	19.95	13.45
Northern No. 2 Fdy., Chgo.	19.00	18.70	18.50	13.00
Lake Superior Charcoal, Chgo.	19.75	19.75	19.25	15.75
Mall. Bess., Chgo.	19.50	19.20	19.00	13.00
Southern No. 2, Birmingham	15.00	15.00	14.50	9.35
Southern Ohio No. 2, Ironton	18.50	18.50	18.00	12.75
Basic, eastern Pa.	20.50	20.00	19.50	13.25
No. 2X Virginia furnace	18.50	18.00	17.50	12.50
No. 2X foundry, Philadelphia	20.50	20.00	19.75	14.25
Ferro mang., Balti., (forward)	175.00	175.00	110.00	100.00
Bessemer billets, Pbgh.	45.00	40.60	33.75	19.50
Bess. sheet bars, Pbgh.	45.00	41.00	33.75	19.60
Op.-h'th sh. bars, Pbgh.	45.00	41.00	34.75	19.50
Open-hearth billets, Pbgh.	45.00	40.60	34.75	19.60
Steel bars, Chgo.	3.10	2.50	2.03	1.38
Steel bars, Pittsburgh, contr.	2.50	2.34	1.865	1.20
Iron bars, Philadelphia	2.559	2.559	2.259	1.20
Iron bars, Cleveland, local del'y.	2.40	2.40	2.00	1.20
Iron bars, Chgo. mill	$2.35	$2.19	$1.83	$1.15
Beams, Chgo.	3.10	2.50	2.03	1.38
Beams, Pittsburgh, contr.	2.50	2.40	1.865	1.15
Beams, Philadelphia	2.659	2.659	2.159	1.35
Tank plates, Pbgh., contract	2.75	2.34	1.875	1.11
Tank plates, Chicago	3.50	3.15	2.05	1.38
Tank plates, Philadelphia	3.659	3.409	2.409	1.35
Sheets, blk., No. 28, Pbgh.	2.90	2.75	2.58	1.80
Sheets, blue an., No. 10, Pbgh.	3.00	2.87	2.45	1.30
Sh., galv., No. 28, Pbgh.	5.00	4.82	4.75	3.30
Wire nails, Pittsburgh	2.40	2.38	2.125	1.59
Connellsville fur. coke, contr.	3.00	2.80	2.38	1.65
Connellsville fdy. coke, contr.	3.50	3.60	3.75	2.25
Heavy melting steel, Pbgh.	18.00	17.95	17.50	11.90
Heavy melting steel, east'n Pa.	18.00	17.50	17.00	11.25
Heavy melting steel, Chgo.	16.75	16.20	15.50	9.30
No. 1 wrought eastern Pa.	23.00	22.50	22.25	12.50
No. 1 wrought, Chgo.	17.00	16.15	15.50	8.55
Rerolling rails, Chgo.	18.00	17.20	17.70	9.85
Car wheels, Chgo.	14.25	14.05	14.75	9.80

(For Additional Prices See Page 844.)

Heavy Foreign Inquiry for Pig Iron

French Government Asks American Makers to Submit Prices on Largest Possible Tonnage of Bessemer Iron

New York, April 11.—Judged by the tonnage sold or inquired for, quite a lively market for iron continues in this district. It is to be noted, however, that most of the total is made up by the needs of a limited number of large buyers. These consumers now are requiring a greater tonnage than they had previously figured on. Miscellaneous business is not so active. An interesting transaction was the closing of 1,500 tons of No. 2X for first half of 1917 by a New Jersey consumer on tidewater. The price was about $21.25, delivered, which is the same figure some eastern Pennsylvania makers ask for last half, but was 50 cents higher than other producers who obtained part of the order have been quoting for this year. The American Steel & Wire Co. has purchased 6,000 tons of standard low phosphorus for this year's shipment to Worcester, Mass., from an eastern maker. The New York Air Brake Co. bought 1,500 tons of foundry and is figuring on 3,000 to 4,000 tons more. A Connecticut buyer closed for 3,000 to 4,000 tons; another Connecticut user took 1,500 tons of malleable; another New England negotiation for 5,000 to 10,000 tons has been terminated. New inquiries include 5,000 tons of low silicon iron for April-July delivery at Dunkirk, N. Y., for the American Locomotive Co.; 2,000 tons of southern for a soil pipe maker; 2,500 tons of No. 1X and No. 2 plain, last half, for a Paterson, N. J., shop; 1,000 tons for a Connecticut melter. Other tonnage is in the market quietly. Prices show steadiness at $20.50 to $21, tidewater, for No. 2X for this year and not infrequently higher is obtained. Buffalo iron is a less active competitor in this territory. The French government, through its authorized purchasing representatives in this city, has put out an inquiry asking makers to submit prices on the largest tonnage of standard bessemer and special bessemer iron they could furnish. Prices are to be made alongside the vessel.

Market Quiet, Prices Strong

Philadelphia, April 10.—Quieter buying has extended to all grades of iron in this district. Prices remain strong with an inclination towards further advance. Inability to make shipments due to freight embargoes and to unfavorable weather conditions continues to cause some increase in furnace stocks, but unfilled orders still gain. There was a moderate increase in March among the furnaces enrolled in the Eastern Pig Iron Association, but the total remains under 100,000 tons. Orders are five to six times as great. Nothing further of interest has transpired in basic. It now is learned that the price in the sale of approximately 20,000 tons of special basic for shipment into next year by an eastern Pennsylvania maker, as reported in these columns last week, was $22, furnace. The special quality contributed to the high price. A steel company is offering a tonnage of standard basic at $20.50, delivered. Standard low phosphorus sales the week totalled 5,000 to 6,000 tons for last half, mainly to one buyer who had reserved this iron. This practically cleans up the offerings of leading eastern makers for this year's delivery. Standard iron is unchanged at $33, Philadelphia. Lebanon makers are closing some business up to $32, furnace. A recent sale of 1,200 tons of low phosphorus to a Newcastle, Del., buyer has been followed by an inquiry for 1,000 tons for another consumer there. The Baldwin Locomotive Works is inquiring for 4,500 tons of No. 2X and No. 3 foundry for third quarter. A Lehigh valley maker has advanced 50c to $1 to $20.50 to $21, furnace, for No. 2X. Two makers now ask the highest figure and are making odd sales at it. Some new inquiry for mill forge is out. The Virginia situation is unchanged. Con-

(*For complete prices see page* 844.)

siderable iron is tied up on track by freight embargoes.

Prices Stiffen at Buffalo

Buffalo, April 11.—Furnaces of the Buffalo district report the development of an inquiry for 25,000 to 30,000 tons of pig iron of the various grades, including foundry largely and a little malleable. This total is made up for the most part of lots from 4,000 to 8,000 tons, and a portion of this inquiry is for deliveries extending over the remainder of the year and into the first part of 1917. The disposition of the producers, however, is not to in any way encourage at this time the booking of material for delivery beyond the end of the year. The shipments continue to go forward in steady volume, the demand for iron under contract keeping up as heretofore reported. Sales for the week were comparatively light, but prices for the most part are, if anything, slightly in excess of the schedule that has held for the past several weeks. The stiffening has not as yet caused prices to advance, but the likelihood of a further raise in prices, if conditions continue as they exist at present, is a situation that may develop within the next week or so.

Many Foreign Inquiries

Pittsburgh, April 11.—Except for numerous inquiries for foreign delivery, most of which are vague and indefinite, the general pig iron market in the Greater Pittsburgh district is quiet. This is not at all surprising, however, since most consumers covered second and third quarter requirements some time ago and heavy tonnages have been sold for the last quarter of the year. Buying for delivery beyond Jan. 1 has been light, although a number of concerns have covered requirements for the first quarter of next year.

An agent yesterday asked quotations on 20,000 tons of basic and 20,000 tons of bessemer iron for shipment to Canada, and a representative of the French government has been negotiating for 3,000 tons of bessemer iron. Domestic inquiries for steelmaking grades are decidedly light. It develops that a valley interest last month sold about 20,000 tons of basic iron to an Ohio consumer at less than $18.25, furnace. No. 2 foundry and malleable iron are selling at a range from $18.50 to $19, valley; forge iron is commanding $18, valley, as a minimum.

Iron Sales Continue

Chicago, April 11.—In spite of expectation that heavy buying of pig iron during March would bring a lull in April, such has not been the case. Although the first week was comparatively slow, inquiry has been resumed and at present is active.

Some demand continues for small tonnages for first half delivery on the part of melters who underestimated their requirement. Most inquiry now current is for last half and is well distributed between foundry and malleable. Small demand is being experienced for basic. No change has been made in quotations, No. 2 foundry remaining at $19 to $19.50, Chicago furnace, and malleable at $19.50, Chicago furnace. Although an advance from these figures has been expected, it has not yet been put into effect.

Contracts already made are sufficient to absorb practically the entire output to Oct. 1 and stocks at furnaces are negligible. Such iron as is being held consists of off iron or high silicon and high manganese, which is easily disposed of at a premium.

Weakness in southern iron continues to be noticeable and while most sellers here are asking $15.50, Birmingham, for first half and $16, Birmingham, for last half, offers at prices below these figures are frequently made. It seems that more warrant iron was in existence at the beginning of the present activity than most sellers realized and this has continued to appear from time to time, with bad effect on the market strength.

Charcoal iron remains at the same level, with considerable sales and consequent reduction of reserve stocks.

Large Cleveland Sales

Cleveland, April 11.—Notwithstanding the record-breaking sales of pig iron made last month, the sales of Cleveland agencies continue at a lively rate. One firm in the first 11 days of April sold 40,000 tons of various grades. In the immediate Cleveland district, there is not much buying, and although some iron has been sold at $19.50, delivered, and $19, furnace, for delivery outside of the city, one firm has shaded this quotation 50 cents. A moderate tonnage has been sold for delivery into 1917.

Quiet at Cincinnati

Cincinnati, April 11. — The pig iron market is passing through a quiet period, which dealers think is only temporary. Inquiries are being secured mostly by salesmen through private solicitation, and the tonnage sold during the past eight or ten days is low in comparison with the same period last month. Prices remain strong. Southern Ohio silvery iron has advanced to $27, furnace, for 8 per cent silicon for 1916 delivery. One Tennessee stack has advanced to $17, Birmingham basis, for its No. 2 foundry iron, but is not making any sales at this figure. Southern No. 2 foundry is generally obtainable at $15 for the first half, and $15.50 for the second half. Some sales have been made to extend into 1917 at $15.50, but a premium of 50 cents for that delivery is usually being asked. Southern iron is undoubtedly strong, but it is not as strong as it should be in comparison with northern iron. Southern Ohio No. 2 foundry is quoted by furnaces at $19, Ironton basis, for 1916 shipment, and

Buffalo Prices

In the New York market report in The Iron Trade Review of March 30, the following was published:—

A Phillipsdale, R. I., consumer closed for 5,000 to 7,000 tons of last quarter basic at $20.08, delivered, or $17.50, Buffalo furnace. A Perth Amboy steelmaker later bought 8,000 tons of basic for the rest of the year from the same Buffalo maker, which, it is reported, was obtained at considerably below $18.25, furnace, or under $20.25, delivered, the freight being $2.10.

The accuracy of the statement as to prices was challenged and The Iron Trade Review has made a thorough investgiation to determine the facts in the case. There is some conflict of evidence, but we are convinced that we were not justified in publishing any statement indicating that a price lower than $18.50, Buffalo, was made. Hence we take pleasure in publishing this acknowledgment of error, and in doing it in a more prominent way than the original statement was made.

The investigation has also demonstrated that the quotation on basic, Buffalo, $19 to $20, published in The Iron Trade Review of March 30, page 734, and in several preceding issues, was too high and that a quotation of $18.50 to $19, Buffalo, more nearly represented the market. This quotation was accordingly inserted in our issue of April 6, page 790, and is repeated today.

The market quotations in The Iron Trade Review approach as nearly to absolute correctness as it is possible to make them, but owing to the extraordinary conditions which have prevailed for the past year in this country, with the rapidly changing prices of iron, steel and metal products, it has been extremely difficult to have an accurate line on all the markets all the time. In spite of this fact, erroneous quotations have been extremely rare.

(For complete prices see page 844.)

resale iron is obtainable at $18.50. The Williamson Heater Co., this city, has closed for 1,500 tons, divided between northern and southern grades for shipment through the last half and into the first quarter of next year. A Mansfield, O., melter has an inquiry out for 1,500 tons of foundry iron for the last half, and a Harvey, Ill., user wants 1,000 tons of foundry iron for the first half of next year.

Moderate Sales

Birmingham, Ala., April 11.—The total sales of the week were not large, though the aggregate of small lots brought the figures to 15,000 to 20,000 tons. The lack of spot or immediate delivery iron seems to affect the situation adversely more than any other feature. Future orders are sufficient to comfortably take care of sellers for some time to come, but the "lapping over" tonnage, or tonnage carried forward from last year, is having its effect on prompt shipment iron. There was probably some tonnage of iron piled on the yards of producers the past month, due partly to insufficient car supply and the "lap over iron." Indications point to the fact that it will take the entire second quarter for consumers to take up the "slack" from last year's deliveries; then production and consumption will be more nearly equal. As yet the large pipe interests have not come into the market for their last half requirements, and unless there is a substantial improvement in the pipe situation, it can hardly be expected that these interests will come in heavily for some months yet. One producing interest reports the sale of 3,000 tons of special analysis iron at $18.50 per ton at the furnace, and 3,000 tons of standard iron at $15.50 per ton for last half delivery. There has been no change in the base price of $15.50 per ton for last half delivery, and one interest is still quoting $15 for remainder of first half.

Nuts, Bolts and Rivets

Pittsburgh, April 11.—Nut, bolt and rivet makers are complaining about the scarcity of steel, being unable to operate plants at desired capacities. It is not unusual for some departments to close down the latter part of the week, because of the scarcity of bars. That prices of nuts, bolts and rivets will be advanced further at an early date, is predicted. Heavy tonnages are being delivered to car and ship builders and exports involve considerable tonnage in the aggregate. South American countries are playing an important part in the American market, buying material formerly furnished by German interests.

Small Tonnage

Unusually Small Supply of Ore at Lower Lake Ports

Cleveland, April 12.—The prospect for the early opening of navigation is still unfavorable, as the ice is very thick and is breaking up slowly. Word has been received from Duluth that the Duluth, Missabe & Northern is prepared to ship 20,000,000 tons of ore this season, 5,000,000 tons more than it has ever shipped. For the first time in 16 years, the ore docks at Conneaut harbor will be practically free of ore at the opening of navigation. At present, less than 100,000 tons of ore remain on the docks, and that is being rapidly reduced.

Smaller tonnage of Lake Superior iron ore remained on lower lake ports on April 1 this year than in many years. March shipments to interior blast furnaces were 1,347,130 tons, leaving a balance of 4,894,495 tons. The balance on dock April 1, 1916, was 1,967,345 tons less than remained on dock on April 1, 1915; it also was 1,833,540 tons less than was on dock April 1, 1913, which was a year of considerable ore movement. Shipments in March over a series of recent years with the balance remaining on lower lake docks on April 1 in the same years, follow:

	March shipments, gross tons.	Balance in dock April 1.
1916	1,347,130	4,894,495
1915	648,848	6,861,840
1914	820,741	7,155,674
1913	1,048,269	6,728,035
1912	902,007	7,032,925

The total tonnage of iron ore remaining on lower lake docks on April 1 in 1916 and 1915, by ports follows:

	Gross tons.	
Port.	1916.	1915.
Buffalo and Tonawanda	212,681	183,805
Erie	459,699	453,210
Conneaut	185,181	819,708
Ashtabula	1,713,643	2,227,981
Fairport	243,682	293,561
Cleveland	1,134,181	1,703,125
Lorain	329,985	430,263
Huron	395,671	462,796
Sandusky	.....	2,471
Toledo	219,772	284,920
Total	4,894,495	6,861,840

The total amount of ore shipped from lower lake docks so far this year was 3,094,822 gross tons, divided among the first three months as follows: January, 887,426 tons; February, 860.266 tons; and March, 1,347,130 tons. This compares with a total of 1,199,600 tons moved in the corresponding three months last year, divided as follows: January, 249,123 tons; February, 301,629 tons; and March, 648,848 tons. The amount moved in the first quarter of this year exceeded that moved in the first quarter of 1915 by 1,895,222 tons.

It is safe to figure that fully as much ore will be moved from lower lake docks in April as in March. Therefore, taking the balance of 4,894,495 tons on dock on April 1, and figuring the April movement at the March rate, in round numbers 1,400,000 tons, this would leave a balance on dock May 1, of about 3,495,000 tons. This would be the smallest balance on dock on May 1 since 1907, when 2,187,962 tons remained. On May 1, 1906, ore on dock was 1,791,090 tons; on that date in 1905, just 2,271,631 tons remained on dock; and in 1904, the unshipped dock ore was 4,534,103 tons.

Wire Strong

But Further Price Advances Not Made —Heavy Export Demand

Pittsburgh, April 11.—No change in the price of general wire products has been made since March 1, when an advance of $2 a ton was announced by leading manufacturers. Flat wire, horseshoes and toe calks were put up a week ago. Several of the more prominent mills are refusing to book additional tonnage, while others are asking premiums ranging from $2 to $4 a ton. The approach of summer likely will be featured by a falling off in domestic activity; the wire market generally is dull and inactive during the summer months and it is not improbable that prevailing high prices will discourage new buying this year.

Demand for export continues heavy, although many mills are not in a position to entertain negotiations for shipment abroad because of inability to meet specifications for delivery.

The Federal Radiator Co., New Castle, Pa., has purchased the properties of the Novelty Iron Co., Canton, O. The equipment of the latter company will be moved to New Castle.

Stockholders of the Trussed Concrete Steel Co., Youngstown, on April 4 approved a resolution to increase the capital stock $1,000,000 for making shop extensions.

I. W. Robertson, formerly connected with the United States bureau of mines at Pittsburgh, is now identified with the Akron Rubber Co., Akron, O.

The Westinghouse Air Brake Co., Wilmerding, Pa., has granted an increase in bonuses ranging from 6 to 12 per cent to its employes.

(*For complete prices see page* 844.)

Buyers Clamor for Plates

Some Sellers Think $75 Per Ton is High Enough, But Sales Are Still Made at Higher Figures

Philadelphia, April 10.—Certain eastern Pennsylvania plate makers now quoting 3.75c, Pittsburgh, as their flat price, express the opinion that the advance in this product has gone far enough for the situation's own good, and they are not inclined to lift their schedules further. These makers, however, are sold up for months ahead, so they are practically out of the market, and it is to be noted that buyers in their eagerness to get satisfactory deliveries, still are bidding up prices. Eastern makers have been approached with offers of 4.50c, Pittsburgh, for large tonnages if they will permit the buyers to name the delivery, but this is impossible, as leading mills in this district are obligated well towards the year end, and one of them is actually oversold for this year, except on universal plates. Large plate consumers, including locomotive builders, are finding that they will require much more tonnage than they previously had figured on, and their utter inability to fill their needs is preventing them from carrying on capacity operations. There are many complaints to the mills from the buyers that shop activities are being held back. Small lots of plates for early delivery have been sold at 5.50c, Pittsburgh. Outputs of eastern plate makers are not up to expectations owing to delayed deliveries on materials, such as furnace linings, shortages of labor, etc.

Tremendous Specifications

Pittsburgh, April 11.—Most mills in the Greater Pittsburgh district are asking 2.75c and above for steel plates. Material for delivery 30 or 90 days hence is not available at less than 3.25c and considerable tonnage has been sold at as high as 4c. Specifications from ship and car builders involve tremendous tonnages in the aggregate, but no new buying of importance is reported this week.

Vessel Building Delayed

Cleveland, April 11.—The building of a number of large lake vessels by an important independent firm has been indefinitely postponed, presumably on account of the high price of material and inability to obtain delivery of plates prior to the spring of 1917. Local mills continue to quote from 3.25 to 4c, Pittsburgh, on plates for fairly early delivery. A leading eastern mill is quoting 4c for December-January delivery. This same mill last week quoted 3.75c for November-December delivery. On an inquiry for delivery within 60 days on a fair tonnage, there was a wide variation in prices and the order was placed at 3.60c.

Plates Hard to Obtain

Chicago, April 11.—Consumers of steel plates find no change in conditions and even from warehouse it is difficult to obtain material. Practically all the plates available for delivery during this year from leading makers have been contracted and only a few makers who have avoided contracts are able to book business for reasonable delivery.

The leading interest, which has no plates to sell for this year, is quoting 2.94c, Chicago mill, on such definite project tonnage as it is willing to book for first half of 1917. This is an advance of $3 per ton over previous quotations and was put into effect without formal announcement.

Forging Billets

Command Fancy Prices—Mills Short on Sheet Bar Supply

Pittsburgh, April 11.—Semi-finished steel products in the Greater Pittsburgh district have not changed position this week. Not much new tonnage is being sold in the open market, since the more important consumers covered second quarter needs early in the year. Both billets and sheet bars are commanding from $45 to $50, mill, and scattering lots of discarded billets, running high in manganese and carbon content, are being sold at as high as $55, mill. Forging billets of special analyses have brought $80, mill, although that figure does not represent the general market.

The scarcity of steel is becoming more pronounced. Sheet and tin plate mills cannot operate at maximum capacities in many instances, because of inability to obtain sheet bars. Consumers of billets are similarly affected.

Many Sold Up

Youngstown, April 11.—With producers well sold up for some time ahead, the semi-finished market is now unusually quiet. Numerous inquiries continue to reach the mills, but producers generally are unwilling to take on additional tonnages owing to the impossibility of making deliveries at an early date. Billets are quoted at a spread of from $45 to $50, but owing to the scarcity of sales, definite quotations are difficult to obtain. It seems certain, however, that the $45 minimum could not be shaded. Sheet mills during the past few weeks have taken the bulk of the tonnage that sheet bar producers offered for third quarter delivery, and the sheet bar market is quiet. Numerous inquiries are still being received for off-heat and discard stocks of special analyses. Few sales of forging billets have been made.

High at Cleveland

Cleveland, April 11.—There is very strong demand for semi-finished material in the Cleveland market and $45 is apparently the minimum for any kind of this material, including sheet bars and slabs. On some tonnages, nearly $50 has been paid.

Semi-Finished is Irregular

Philadelphia, April 10.—Considerable business continues to be done in large round crops, misfit lots of blooms and other irregular rerolling steel as offerings of new material are scant, but the market shows a rather wide spread in prices. Further sales of misfit open hearth blooms in less than 500-ton lots have been made in this district at $55, Ohio mill. A large steel maker is offering a tonnage of crops from 3¼-inch, or shrapnel sizes of rounds of irregular lengths, but suitable for rerolling, at $38, delivered in this territory. As recently noted, an eastern Pennsylvania munition maker has been asking $52, mill, for similar material. A Philadelphia broker is inquiring for 1,000 tons of low phosphorus crops. Eastern Pennsylvania steelmakers within the week sold ordinary rerolling open hearth billets in sizeable tonnage at $50, mill, and experienced little or no trouble in doing so. The same producer is holding forging billets at $65, mill base, minimum, and has made sales where the steel was of special character up to $75, mill. Eastern makers are unable to offer billets except for late this year delivery.

John P. K. Miller, 59 years old, chief engineer of the H. C. Frick Coke Co., Pittsburgh, died April 9 at his home in Scottdale, Pa. He went to Scottdale about 30 years ago to become chief engineer of the McCluer Coke Co., which was merged with the Frick interests. Mr. Miller was a member of the American Institute of Mining Engineers. He was born in Martinsburg, W. Va.

(*For complete prices see page* 844.)

Cannot Get Steel Bars

Manufacturers of Munitions Are Having Their Troubles —Bethlehem Steel Co. Only Bidder at Washington

Philadelphia, April 10.—Manufacturers of munitions who some months ago covered themselves upon their steel requirements for the first half, now are meeting much difficulty in obtaining last half material owing to the heavily-sold condition of the mills. A number of them, including both foreign and domestic interests, now are in the market for liberal tonnages of large rounds for last half upon which they are willing to pay advanced prices, but the problem is to find the mill that can take them on. The fact that the steelmakers will carry past July a much larger tonnage than they originally bargained upon, increases the present difficulties of the buyers. Eastern steelmakers have had opportunities to accept up to 30,000 to 40,000 tons of large rounds for last half at around 4.25c, mill, if they could promise the deliveries. On a lot of 4,000 3 to 6-inch common shells for the Frankford arsenal, this city, just awarded by the government to the Bethlehem Steel Co., the latter was the only bidder agreeing to supply the steel. Some of the munition makers bid on the machinery only, stipulating that the government furnish the steel. The shell steel bar market now is the most active in some weeks and some good tonnages have been put through with mills outside this territory at about 3.75c to 4.25c, mill, depending on the size. On soft steel bars, one maker has been offering here odd sizes at 3c, mill. Regular mill deliveries continue a matter of many months and the official price of 2.50c, Pittsburgh, adopted by some leading sellers remains nominal. Shafting took another sharp jump April 5 to 15 and 10 off, an advance of 15 points, or $30 a ton.

100,000 Tons For Rounds

New York, April 11.—Considerable activity by ammunition manufacturers in contracting for large rounds for last half delivery has developed in this territory during the past week or two. It is estimated by those who have participated in this trade, that sales have approximated 100,000 tons. Most of this buying has been for export shipment to France. A recent inquiry for 60,000 tons of steel for 9 to 9½-inch shells, which was handled by leading purchasing representatives in this city of European belligerents is reported to have been included in the tonnage placed. It is believed that over 4c, mill, was paid for these sizes. Some of the recent orders for large rounds, particularly in the shrapnel sizes, have been done at 3.75c, mill, and 3.50c is reported. The market now appears firmer. In the new contracts placed for last half, it is stipulated that buyers may cancel by Jan. 31, any arrearages on shipments. An active inquiry for shell steel remains pending.

Small Bar Inquiry

Chicago, April 11.—Consumers of soft steel bars are not pressing so strongly for further tonnages, as inquiry over past weeks has given them to understand that practically nothing can be obtained beyond their present contracts for delivery during this year. Either they have decided to proceed with what material they have obtained already or are turning their attention to other sources, small mills here and there which can turn out a small tonnage occasionally to fill an emergency.

The leading interest is now quoting 2.64c, Chicago mill, on soft steel bars on such business for 1917 delivery as it is willing to book.

This tonnage for next year's delivery is being taken only on definite projects, such as railroad cars, bridges, steel for structural purposes and other business which must be covered.

Buyers of bars for ordinary manufacturing purposes have been unable to place any orders for 1917 up to this time. Such small lots of bars for immediate delivery as can be obtained occasionally are bringing large premiums over present nominal prices.

Commanding Premiums

Pittsburgh, April 11.—Consumers of steel bars are paying premium prices to obtain material for prompt delivery. Several rivet manufacturers have paid as high as 3.25c for stock in order to fill contracts. All manufacturers are asking 2.50c and above for future delivery.

Pittsburgh makers of bar steel, it is apparent, do not expect to offer reduced prices of any kind to consumers who have enjoyed concessions in past years. When some agricultural implement makers covered second half requirements several months ago, it will be recalled that they paid the prevailing market price, namely, 1.90c. Officials of several concerns say agricultural implement concerns will be quoted the prevailing price if they enter the market for additional tonnage.

The market for bar iron is strong, at a range from 2.50c to 2.75c and it is believed that the minimum figure will disappear this month.

Bar Iron Steady

Chicago, April 11.—The situation as to bar iron is unchanged with mills working at capacity and books containing at least 60 days business. Some mills are booked ahead for 90 days, but for the most part bar iron makers are avoiding long contracts and practically nothing has been sold beyond July 1. Quotations remain steady at 2.35c, Chicago mill, for first half and at 2.50c, Chicago mill, for third quarter on such small business as is being taken for that delivery.

Shafting Higher

Pittsburgh, April 11.—The price of cold rolled steel shafting rapidly is approaching the list. Some mills are asking 20 per cent off for carloads, although the 25 per cent off figure has not quite disappeared. Makers in a position to meet specifications for early delivery are quoting as high as 10 per cent off the list, or $90 a ton. Warehouses are selling material at 10 and 20 per cent above the list price.

Hoops and Bands

Pittsburgh, April 11.—Steel hoops are decidedly strong at 2.75c, Pittsburgh. Manufacturers are refusing to book additional tonnages almost every day and it is declared that this product is decidedly scarce. Steel bands are commanding 1.50c for delivery at the convenience of the mill.

Buys Manganese Ore

Philadelphia, April 11.—A recent sale of 10,000 to 20,000 tons of Brazilian manganese ore to makers of ferro-manganese in this country has come to light. The price was 40 cents per unit, at Rio Janeiro, which, at current freight rates, is equivalent to between 60 and 65 cents per unit, at Philadelphia or Baltimore. As far as known, this is the last sale of foreign manganese ore made to buyers in this country. Inquiries now are pending for one or two cargoes, but there is practically no ore offering, as the output of the Brazilian mines is sold up for a number of months. There have been some offers of foreign manganiferous ore, but buyers have not been interested in mineral of this quality at the prices quoted because domestic ore of this character is available at even a lower figure.

(*For complete prices see page* 844.)

Sheet Market is Stronger

Galvanized Presents Irregularities—Cleveland Mill Unable to Obtain Sheet Bars—Tin Plate Very High

Pittsburgh, April 11.—The general situation for steel sheets rapidly is becoming stronger and the usual price differentials between different gages virtually have disappeared. Tin mill black sheets are commanding as high as sheet mill sizes. Manufacturers of stove plate, enameled ware and many lines of cooking utensils are buying heavy tonnages of tin mill black sheets and shipments abroad are unusually heavy. Many manufacturers are refusing to shade 3c for No. 28 gage tin mill black sheets. Specifications for black and blue annealed sheets gradually are increasing in volume and prices below 3c for base size rapidly are disappearing. For the first time in many months, the situation for galvanized products reflects irregularity; some manufacturers have sold heavy gages of galvanized material on the basis of 2.75c for No. 28 gage. On the other hand, some mills are obtaining above 5c, base, for galvanized sheets.

Improved Tone

Youngstown, O., April 11.—The sheet market has shown an improved tone during the past week. This strength, while somewhat surprising in view of the already firm character of the market in recent weeks, is more in line with the strength revealed by other steel products. The sheet market, due to causes which have been explained in previous reviews, has been somewhat laggard in following the upward trend of the iron and steel market. Probably the principal cause was the advancing price of spelter, which effectually shut off the bulk of the galvanized sheet trade.

At present, however, light sheets are showing more firmness than at any time for some months. Although the roofing trade, which ordinarily consumes a large tonnage of light sheets, is still unsettled, demand for light sheets in other lines has shown considerable improvement. Coupled with this increased interest on the part of the buyer, many sheet producers find themselves unable to sell the finished sheet at prices which prevailed a few weeks ago. With sheet bars for both contract and prompt delivery selling for $40 to $45, the sheet mills are being forced to ask more for their products. Most of the mills in this district are maintaining a good rate of operations. Some fear, however, is expressed that a shortage of steel developing near the close of the second quarter may result in shutting down some of the mills until they can replenish their bar banks.

The bulk of the inquiry reaching the sheet mills is coming from the automobile and electrical industries. Demand, however, is insistent from practically all classes of sheet consumers. The minimum quotation of 2.90c on black No. 28 has been abolished by most of the mills. Few mills would be willing to shade 3.00c on open hearth stock for prompt delivery. Blue annealed No. 10 is held at 3.00c to 3.10c. Some mills, however, are holding at 3.25c and higher. Galvanized sheets No. 28 are quoted at 4.85c to 5.25c. The market for this grade has strengthened somewhat during the week. The irregularities in the spelter market, however, continue to have a depressing influence on the galvanized sheet trade.

Booked Up; Little Selling

Philadelphia, April 10.—Very little new business in sheets now is moving to eastern Pennsylvania makers, as order books are filled up to the fourth quarter. Specifications continue heavy. Prices are quoted by eastern makers at from 3.75c to 4c, Pittsburgh, or 3.909c to 4.159c, Philadelphia, for No. 10 gage blue annealed.

Tin Plate Soars

Pittsburgh, April 11.—Unprecedently high prices are being paid for tin plate. No evidence of sales below $4.50, base, can be found and as high as $5, base, is being paid in isolated instances. Not much tonnage, however, has been sold at the high prices prevailing today, since the more prominent consumers covered needs last autumn. Heavy tonnages are being shipped abroad, and inquiries for export are numerous, although many mills cannot entertain them, being unable to incur additional obligations. The scarcity of sheet bars continues to affect production considerably.

Operating Riverside Plant

Cleveland, April 11.—The Otis Steel Co. is now operating its Riverside plant, after a long idleness, and is making the heavier gages of sheets, for which there is an active demand. The new Empire Rolling Mill Co. is ready for operation, but has not been started on account of the inability to buy sheet bars at a price which would permit the manufacturing of light sheets at a profit. Although contracts were made some time ago by some mills for sheet bars at $38, $45 cannot be shaded at the present time. There is active inquiry for export.

(*For complete prices see page* 844.)

Cast Iron Pipe

Will be Purchased by Rochester — Business is Only Fair

New York, April 11.—Bids will be received by Rochester, N. Y., on April 19 on 12,000 tons of 37-inch cast iron pipe and castings for water line construction. Alternate bids also will be taken on 10 miles of lock-bar steel pipe. Philadelphia has asked for figures for April 18 on 1,850 tons of 6 to 36's. R. D. Wood & Co. have taken 250 tons for Acushnet, Mass., at $35, delivered, for the 4's and $32, delivered, for the 6, 8 and 10's. Fall River, Mass., has taken bids on 190 tons of 6 to 10's. Niagara Falls will readvertise 2,425 tons of 4 to 30's, on which the United States Cast Iron Pipe & Foundry Co. was low, as all the bids have been rejected. While new business continues of fair volume, both in private and public requirements, all the makers could handle a considerably larger tonnage. Competition, while keen, is not at the expense of prices, owing to high raw material costs, and quotations are quite uniform.

Will Blow Out

Chicago, April 11.—Stack "D" of the Iroquois furnace at South Chicago will be blown out soon after April 15 for relining. Material is already on the ground and the furnace is expected to resume activity by June 1.

One stack at Bayview furnace of the Illinois Steel Co., at Milwaukee, is expected to go out early this summer for relining, although at present it continues to do good work on the present lining.

Cold Rolled Strip Steel

Pittsburgh, April 11.—Rather heavy tonnages of cold rolled strip steel are being sold for shipment the second half of the year on the basis of 6c as a minimum. We note three sales, of 1,200 tons, 1,000 tons and 800 tons each, at 6c, base. Considerable tonnage is commanding 6.25c and sales at 6.50c are reported in some instances.

The Etsmith Spelter Co. has been formed by a number of men living at Warren, O., who are interested in zinc mines in Arkansas and Missouri. The company, capitalized at $350,000, has been incorporated by John T. Harrington, U. C. DeFord, J. W. Blackburn, Fred J. Heim and R. B. Wilson.

Scrap is Weaker

In Some Centers—Much Uncertainty at Pittsburgh

Pittsburgh, April 11.—Following a decidedly active buying movement, in which the Corporation participated conspicuously, the market for heavy melting steel in the Greater Pittsburgh district is irregular and uncertain. So far as can be ascertained, the Corporation did not pay more than $18.50, delivered, for heavy melting stock; some middlemen, believing that prices would soar to decidedly high levels, several weeks ago paid as high as $19.25 for heavy melting steel. Some of this tonnage, since has been sold at a loss to dealers. Some heavy melting stock has been obtained by melters at $18 and several dealers are refusing to pay more than $17.75 for this material. Middlemen believe that prices will advance sharply just as soon as active buying is resumed.

Old Rails for Export

Philadelphia, April 10. — An eastern steelmaker has made a new sale of 15,000 tons of old rails and heavy melting steel stock for export. The price has not been given definitely, but it is understood to have been around $22 to $23, seaboard. Italy is believed to have been the purchaser, as that country in recent months has purchased for that destination a round tonnage of rail and ingot crops. Something of a deadlock exists in the heavy melting steel market in eastern Pennsylvania territory. The most the makers will pay is $18, delivered, but they are not able to get more than small lots at this figure, as the dealers want $19, delivered, for tonnages. No. 1 railroad wrought is in strong demand and scarce. Important sellers of low phosphorus scrap ask up to $23.25, delivered, but have not closed any business at this figure. The market is quieter, due, it appears, to the heavy shipments that now are going forward, but prices are steady.

Scrap for Blast Furnaces

Buffalo, April 11.—In everything but turnings and borings the Buffalo old material market is quiet, with no changes of prices to be noted. An inquiry for turnings and borings has come into the market from the Pittsburgh district from several furnaces that are taking on available tonnages to mix with the ore on hand in the making of pig iron. This situation has been brought about by the apparent shortage of their hold over supplies of ore and the anticipated delay in the opening of navigation on the lakes, making possible the bringing down of fresh supplies to pile up their yards against the coming season. A demand of this kind for turnings and borings will cut into available supplies and cause a stiffening in prices to be reported at any time now.

Cleveland Market Nearing Standstill

Cleveland, April 11.—There is much speculation rife in the Cleveland market whether the recent slump of heavy melting steel in the Pittsburgh district will have any immediate effect upon local conditions. According to some dealers, the result has been already felt, though prices remain the same. Mills are not interested in scrap unless offered at a heavily shaded figure. The open weather has contributed largely to the general condition since scrap is easily obtained in this and other localities. It is believed that a heavy tonnage of material will be available shortly from the northwest, which territory, to date, has not been able to ship any sizeable quantity of this commodity. The Empire mill has requested dealers with whom they have contracts to hold material out of that melter's yards as long as possible. This is virtually an embargo, but fortunately, for the dealers, is not being as rigidly enforced as might be, were a straight embargo declared. The most optimistic dealers declare that the present lifeless condition of the local market will prevail for three to six weeks and at the end of that period at least some of the mills will feel it imperative to re-stock their yards. Until that time, some price revision downward may take place, but this is not expected to be serious or to cause any startling slump. Heavy melting steel is quoted at $17.00 to $17.25, gross tons, Cleveland, unchanged from last week.

Chicago Market Quiet

Chicago, April 11.—Consumers in this district are not buying scrap at present and the situation is without features. Quotations remain practically unchanged and almost the only dealings now met are between brokers who are seeking to cover their short sales in the recent buying movement.

Railroad scrap is being offered more freely and an unusual number of lists are now current, although the total tonnage is not as large as sometimes is the case. Among present offerings are the following: Chicago, Milwaukee & St. Paul railroad, 4,000 tons; Rock Island, 1,500 tons; Kansas City Southern railroad, 630 tons; Chicago, Peoria & St. Louis railroad, 125 tons; Mobile & Ohio, 700 tons; Southern railroad, 2,500 tons; Union Pacific railroad, 3,800 tons; Michigan Central, 1,600 tons; Great Northern, 4,000 tons. The feature of the Great Northern list is that it offers 3,000 tons of No. 1 steel rails.

Weaker at Cincinnati

Cincinnati, April 11. — Continued activity in the iron and steel scrap market, and the gradual accumulation of a surplus in dealers' yards, are causing prices to become weaker, and a decline is looked for in the near future. Prices today are unchanged, principally because of heavy shipments on old contracts to rolling mills. Foundries are buying very sparingly. Heavy melting steel continues to be the most active of all old materials carried in local yards, and is quoted at from $14.25 to $14.75 per gross ton.

Firm in South

Birmingham, Ala., April 11.—The old material market continues firm, and prices have been advanced on practically all articles. The market is particularly active in the matter of steel rails and steel axles, and some fancy prices have been obtained. Stove plate and light remelt scrap have shown improvement. A large eastern inquiry was received during the week for 10,000 tons of old steel rails, but as yet this tonnage is not in sight. There have also been some shipments of steel rails and miscellaneous steel scrap, as well as axles, into eastern territory at fancy prices, compared with the local or home market.

Pipe is Active

Mills Report Strongest Demand in History of Trade

Pittsburgh, April 11.—The market for tubular goods is decidedly active, more so, manufacturers say, than at any time in the history of the trade. No large single projects are being undertaken, but general activity is enjoyed and specifications involve tremendous tonnages in the aggregate. Prevailing high prices of crude oil have stimulated development in the oil fields, where heavy tonnages of tubing, casing and drive pipe are being consumed. It is not unlikely that prices will be advanced at an early date.

Prices of iron and steel boiler tubes are decidedly strong. Mills are unable to promise deliveries in less than from three to seven months. Prevailing prices are nominal; most manufacturers are asking $1 and $2 a ton above published quotations.

(*For complete prices see page* 844.)

Ferro Market

Is Not so Excited, But Very High Prices Still Prevail

New York, April 11.—More orderly conditions of trading continue to prevail in the market for ferro-manganese and spiegeleisen, as pressing needs appear to have been taken care of and buyers are more careful in obligating themselves at the extraordinary prices now current. The strength of the market, however, is unimpared. If buyers require the metal quickly, they must pay the record figures quoted for spot or nearby. While the demand of this character is very limited, the supply equally remains scant. Some domestic producers report a fair demand for ferro-manganese for shipment by July of this year and quotations as high as $550, seaboard, have been made for such delivery. No sales, however, have been closed at such a figure and the prompt market continues at from $400 to $450, seaboard. It is to be noted that a lot of 50 tons of English ferro-manganese which has been offered from this territory for the past two weeks at $425, seaboard, still is unsold. Some contracting of English ferro-manganese for first half of next year at $175, seaboard, is proceeding. One seller in the week disposed of 2,000 to 3,000 tons of such business and some tonnage still is offered. Some fourth quarter metal still can be had at $200, seaboard. It is reported some English metal for shipment by July may be offered from abroad soon.

There is some spread in prices for 20 per cent domestic spiegeleisen for forward shipment. One maker is quoting $60, furnace, for last half and another $65, furnace. The latter continues to make sales at this figure. Prompt spiegeleisen is held at high figures. On a lot of 17 per cent, $100, furnace, was quoted within the week. A western producer has been asking about $105, furnace, for 30 to 35 per cent, for April shipment. A sale of 1,500 tons of 13 to 14 per cent bessemer ferro-silicon, has been made in the Philadelphia territory at somewhat above the openly quoted prices of $34, furnace. There are offerings in the market of small lots of ferro-tungsten at about $8, per pound, of contained tungsten at seaboard, duty paid. Negotiations continue for the sale or leasing of several eastern furnaces by domestic interests for the making of ferro-manganese and spiegeleisen.

Alloys Scarce and High

Pittsburgh, April 11.—A consumer in this district last week closed for 1,000 tons of 80 per cent ferro-manganese for delivery the first six months of 1917 at $175, seaboard. Material is not available at that figure, however, for delivery before Dec. 31. Scattering lots of this alloy have commanded as high as $425 a ton, at the seaboard, and some dealers are asking $450, seaboard. Demand for spiegeleisen continues heavy and premium prices are being obtained by manufacturers in a position to promise rather prompt delivery. Fifty per cent ferro-silicon and lower grades of this alloy are scarce; it is not unlikely that prices will be advanced at an early date. Prices of steelmaking metals are nominal.

Taking Orders at Chicago

Chicago, April 11.—The remaining stack at the Iroquois Furnace at South Chicago will be blown in about April 15 by the Miami Products Co., which has entered into an arrangement to use this stack for the production of spiegeleisen and ferro-manganese from domestic ores.

Sufficient ore has been accumulated at the furnace to make continuous operation certain and between 4,000 and 5,000 tons of manganese iron, from 20 to 80 per cent, has been sold for delivery beginning about the middle of May to the end of this year. At present orders are being taken for 70 to 80 per cent manganese and practically the entire range has been covered in existing contracts.

Ore has been obtained from various domestic sources and is not dependent on imports. Sales have been made at $4 to $5 per unit of manganese, the latter figure prevailing in recent sales.

Warehouse Prices

Are Advanced at Philadelphia—Continued Active Demand

Philadelphia, April 11. — Another sharp uplift of prices on iron and steel products from store has been made by jobbers in this district. Steel bars up to 2-inch now are held at 3.25c, for Philadelphia delivery, and the same figure is asked on structural shapes. Steel rounds and squares over 2 inches are quoted at 4.10c. Plates are at 4c.

Warehouse Prices Up

Cincinnati, April 11. — Warehouse business continues very brisk and prices are gradually advancing. Cold rolled round bars are now given at 8 plus the list price, and flat, square and hexagon at 10 plus the list price. Hot rolled steel and iron bars are unchanged at from 3.20c to 3.75c and shapes and plates at from 3.20c to 3.50c. Warehouse prices on sheets have been advanced. No. 1 blue annealed are now quoted at 3.50c, No. 28 black at 3.95c and No. 28 galvanized at 5.65c. Another advance is expected before the end of the week.

(*For complete prices see page* 844.)

Furnace Coke

For Prompt Shipment Has Developed Decided Weakness

Pittsburgh, April 11.—The heavy production of coke, coupled with improved shipping conditions, has combined to weaken the situation for blast furnace fuel for prompt shipment. A week ago the Lackawanna Steel Co., affected by a strike at coal mines operated by subsidiary interests, paid $3 for 48-hour coke for delivery this month. During the last few days fuel has sold at as low as $2.25, ovens, and talk of $2 coke is heard. The market is almost at a standstill; no new demand of importance is reported and consumers do not appear to be interested in future requirements. Foundry fuel is unchanged in position, although prices, if anything, are stronger than they were a week ago. The *Connellsville Courier* for the week ending April 1 says production of coke in the Connellsville regions was 476,995 tons, an increase of 17,533 tons, compared with the week previous.

Contracting Heavy

Cincinnati, April 11.—Contracting by foundries for yearly requirements beginning July 1 continues very heavy, and is the principal item of interest in the coke market here. Very little furnace coke is being sold, except for spot shipment to fill in between deliveries on contracts. Wire county foundry contract coke is quoted at from $3.50 to $3.75, ovens; Pocahontas foundry contract at from $3.25 to $3.75, ovens, and New River foundry at from $3.75 to $4.25, ovens.

Virginia Coke Sale

Philadelphia, April 11.—A sale of 9,000 tons of Virginia furnace coke for last half shipment, has been made to a Virginia consumer at current market prices in that district.

A number of machinists and machinists' helpers employed at the Twenty-eighth street plant of the Westinghouse Electric & Mfg. Co., Pittsburgh, went on a strike April 7, following the refusal of the company to grant an increase in wages. The men were employed finishing shells for one of the entente nations.

March Record

Made by Structural Shops Better Than Expected

New York, April 11.—A general reduction in structural undertakings, as the result of the present high prices, is not apparent in the total tonnage booked by the fabricating shops of the country during March, which, according to the statistics of the Bridge Builders' and Structural Society, was considerably heavier than during either February or January. Bookings in March were 102 per cent of shop capacity, equivalent to approximately 175,500 tons, compared with 129,000 tons in February and 119,000 tons in January. The March tonnage would have been considerably heavier had it included the awards made to the American Bridge Co. for new plant construction by its co-subsidiaries of the Steel Corporation. Such awards always are eliminated in the American Bridge Co.'s report of bookings to the society. The monthly statistics of the Bridge Builders' and Structural Society, showing the percentage of capacity contracted for and the approximate tonnage reported, are as follows:

Month.	Per cent.	Approx. tonnage.
March, 1916	102	175,500
February	75	129,000
January	69	119,000
December, 1915	121	208,000
November	105	180,000
October	78	135,000
September	67	115,000
August	85	146,000
July	86	148,000
June	80	138,000
May	61	105,000
April	62½	107,500
March	64	110,000
February	30	51,000
January	25	43,000
December, 1914	35	60,000
November	20	35,000
October	35	60,000
September	38½	65,000
August	27½	48,000
July	68	115,000
June	56½	95,000
May	57	97,000
April	88	151,000
March	76	130,000

A feature of the structural market in this territory continues to be the number of jobs that are being figured quietly or awarded without announcement from the builders. Details are denied even to the mills in a number of cases where steel bids are asked. The market shows considerable activity in new work, especially in smaller projects, which are numerous. The lifting by the New Haven railroad of its embargo on structural material shipments into New England, temporarily, at least, relieves the situation, which has been seriously interfering with the operations of the mills and fabricating shops. Plain material prices are firm at from 2.50c to 3c, Pittsburgh, or at from 2.669c to 3.169c, New York. Fabricating prices are rising in accordance with mill shipments to the shops, and $85, erected, now is the common figure on ordinary work in this territory.

Very Little Bidding

Cleveland, April 11.—Owing to the fact that many structural shops have exhausted their stock of steel and are finding it difficult to contract for anything like early delivery, there is very little bidding on new business at the present time. One contract for erecting a building was offered to a number of shops and only one submitted a bid. The new hotel to be erected on Prospect avenue, near East Ninth street, by J. L. Free and others, will be called the Hotel Winton, in honor of Alexander Winton, the automobile manufacturer. The steel will be furnished by the American Bridge Co.

CONTRACTS AWARDED.

Semet-Solvay Co., Buffalo branch new by-product coking plant, four large buildings, taking 1,100 tons structural, contract to Ferguson Steel & Iron Co., Buffalo.

Miscellaneous bridge work for the Atlantic Coast line, 650 tons, to the American Bridge Co.

Nine bridges for the Pennsylvania railroad, 550 tons, to the American Bridge Co.

Addition to Barnard College, New York City, 800 tons, to Levering & Gerrigues.

Wetherly building, West Thirty-ninth street, New York City, 500 tons, to the Passaic Structural Steel Co.

Office building on Liberty street, New York City, adjoining the Guarantee Trust Co. building, 1,500 tons, to Milliken Bros.

Addition to the Traylor Engineering Co., Allentown, Pa., 600 tons, to an independent shop.

Sugar mill construction at Tacajo, Cuba, 1,000 tons, to the Virginia Bridge & Iron Works.

Steel work for new iron ore dock of Witherbee, Sherman & Co., Inc., Port Henry, N. Y., 300 tons, to the Belmont Iron Works.

Shops for the Burlington railroad, West Burlington, Ia., 2,600 tons, to the American Bridge Co. Westinghouse, Church, Kerr & Co., New York, engineers in charge.

Addition to the store of Strawbridge & Clothier, Philadelphia, 300 tons, to the Eastern Steel Co.

Phipps loft building, Forty-fifth street and Madison avenue, New York City, 1,400 tons, to the American Bridge Co.

Loft building, West Thirty-eighth street, New York City, for the Felcourt Realty Co., 650 tons, to the Hedden Iron Construction Co.

Presbyterian church house, Madison avenue and Seventy-third street, New York City, 500 tons, to the Hinkel Iron Works.

Plate and angle shop for Samuel L. Moore & Sons Corporation, Elizabethport, N. J., 500 tons, to Levering & Gerrigues.

Garage for the Bournenville Realty Co., West Sixty-fourth street, New York City, 300 tons, to the Hinkel Iron Works.

The American Bridge Co. will furnish steel for the new plant of the National Tube Co. at Gary, Ind., involving about 20,000 tons.

Indiana Steel Co., 40-inch blooming mill, Gary, Ind., 875 tons, to American Bridge Co.

Transmission towers for the Duquesne Light Co., Pittsburgh, 750 tons, to the American Bridge Co.

Missouri & Kansas Telephone Co., building at Wichita, Kas., 435 tons, to American Bridge Co.

Stock house for the Adolph Gobel brewery, Brooklyn, 200 tons, to Antone Fleugel.

Wilcox Motor Car Co., 2,000 tractor wheels, Minneapolis, 365 tons, to French & Heck, Davenport, Ia.

Garfield Smelting Co., Roaster building and flue extension, Garfield, Utah, 323 tons, to American Bridge Co.

Garfield Smelting Co., material for reconstruction of converter aisle, Garfield, Utah, 319 tons, to Wisconsin Bridge Co.

Winnebago county, Wis., bridge over Fox river, Omro, Wis., 215 tons, to Wausau Iron Works.

CONTRACTS PENDING.

Bridge work for the Southern railway, 1,600 tons, bids pending.

Three grade crossing viaducts at Niagara Falls for the New York Central, 800 tons, bids pending.

Eight bridges for the Lehigh Valley railroad, 500 tons, bids pending.

Two bridges for the Maine Central, 550 tons, bids pending.

Bridge work for the Virginian railway, 100 tons, bids pending.

Addition to the Boston Public Library, 300 tons, bids pending.

Bridges for the Pennsylvania railroad, about 450 tons, bids pending.

Semet Solvay by-product coke plant for Wickwire Steel Co., Buffalo, 1,000 tons, bids being taken.

Extension of plant of American Locomotive Co., Schenectady, N. Y., 600 tons, bids being taken.

By-product coke plant, Buffalo Union Furnace Co., Buffalo, 2,000 tons, Westinghouse, Church, Kerr & Co., New York, engineers in charge.

Building for the Logan Trust Co., Philadelphia, 200 to 300 tons, bids being taken.

Apartment house for the Six Hundred Thirty Park Avenue Co., 630 Park avenue, New York City, 700 tons, bids being taken.

Loft building for the Ritz Realty Co. at Twenty-sixth street and Broadway, New York City, 1,000 tons, bids being taken.

Pennsylvania Railroad Co., grain elevator, Erie, Pa., replacing one destroyed by fire, 1,000,000 bushel elevator, large tonnage structural and reinforcing material, to award contract soon.

Buy Rails

Considerable new rail buying is announced. The Reading has closed for about 15,000 tons with three eastern mills; the Wabash divided 14,000 tons between the Lackawanna Steel Co. and the Steel Corporation; the Soo line ordered 14,000 tons of the Illinois Steel Co.; the Northern Pacific is reported to have placed 15,000 tons and to be about to close for 15,000 tons additional; the Norfolk & Western has placed 4,000 tons with the Bethlehem Steel Co. The Tennessee Coal, Iron & Railroad Co. has taken a number of miscellaneous orders, including 2,000 tons additional for the Atlantic Coast line, making 18,000 tons in all, 2,500 tons for the New Orleans, Texas & Mexico, 1,000 tons for the Carolina, Clinchfield & Ohio and 1,000 tons for the Louisville River & Navigation Co. The Maine Central is inquiring for 7,500 tons.

(For complete prices see page 844.)

Buys Andrews & Hitchcock Interests

Youngstown Sheet & Tube Co. Takes Over Blast Furnaces, Ore and Coal Holdings—History of the Hubbard Concern

Youngstown, April 12. (By wire.)—The Youngstown Sheet & Tube Co. announces today it has purchased the blast furnaces, ore, coal and other properties of the Andrews & Hitchcock Iron Co. This is the most important industrial transaction that has taken place in this city in many months, since it marks the passing of the Andrews & Hitchcock company from the merchant pig iron market, in which it had been an important factor for almost 50 years. It also provides the Youngstown Sheet & Tube Co. with facilities for supplying the basic iron, for which it has gone into the market at various times to supplement its own furnace production. By this purchase, the Youngstown Sheet & Tube Co. obtains further important Lake Superior iron ore reserves and 1,123 acres additional of Green county, Pa., coal land as yet undeveloped.

The Andrews & Hitchcock Iron Co. has two stacks at Hubbard, O., half a dozen miles north of Youngstown. Its nominal capital stock of $400,000 was divided into 4,000 shares of $100 par value each. The Sheet & Tube company purchased this stock and took possession of the plant yesterday. The purchase price was several million dollars. The stock of the Andrews & Hitchcock company was closely held by the heirs of C. H. Andrews and William J. Hitchcock, now both deceased, original founders of the company. The officers of the Andrews & Hitchcock company are: President, Frank Hitchcock; secretary and treasurer, Henry W. Heedy, who, with W. J. Hitchcock, Mrs. Louisa Andrews, Mrs. John A. Logan Jr., Mrs. Leslie C. Bruce, of New York, City, and Mrs. Upson A. Andrews, of Cleveland, were the principal stockholders.

President James A. Campbell, of the Youngstown Sheet & Tube Co., told *The Iron Trade Review* that his company will carry out all the contracts for pig iron, coke, etc., held by the Andrews & Hitchcock company. The Sheet & Tube company will continue to operate its Hubbard property in the name of the Andrews & Hitchcock Iron Co., at least for the present. If possible, one stack will be run on basic pig iron for delivery in the last half of this year, this being for the account of the Sheet & Tube company. The other stack may be run as a merchant furnace, making either foundry or basic pig iron, as the market demands.

One important feature of this purchase is that it carries with it a 12 per cent interest in the Mahoning Ore Co., which has a lease yet to run 83 years on the Mahoning mine in the Mesabi range. This is one of the most important mines in the Mesabi district, last year shipping 2,311,940 tons. The other owners of the stock of the Mahoning Ore Co. are the Cambria Steel Co. (now a Midvale Steel & Ordnance Co. subsidiary), 50 per cent; Carnegie Steel Co., 20 per cent; Andrews & Hitchcock Iron Co., 12 per cent, or 6/50; Hanna interests, 12 per cent, or 6/50; Republic Iron & Steel Co., 6 per cent, or 3/50. Beside the 1,123 acres of Green county, Pa., virgin coal lands, the Andrews & Hitchcock Iron Co. also conveyed to the Sheet & Tube company 500 acres of surface rights on the same property for mine opening purposes.

Roberts Ovens

Will be Installed at New Buffalo Plant —Bonds Are Offered

Work has been started on the by-product coke plant which is to be built at Buffalo by the Union By-Product Coke Co. The Roberts type of ovens are to be installed. The plant will cost $1,800,000, including the land, and the contract for its construction has been awarded to the American Coal & By-Products Coke Co., under the supervision of Westinghouse, Church, Kerr & Co., engineers. The management will be under the direct supervision of the Buffalo Union Furnace Co., which has contracted for the entire output of coke, 1,000 tons per day, during the life of the bonds. M. A. Hanna & Co., Cleveland, are closely identified with the company and will be distributors of its product. A plant for the manufacture of benzol and other by-products will be included.

The Tillotson & Wolcott Co., Cleveland, is offering for sale $1,000,000 in first mortgage 6 per cent bonds of the Union By-Product Coke Co. The bonds mature at the rate of $100,000 per year, from 1918 to 1927, inclusive. The officers of the company are: President, F. J. Lewis, of the F. J. Lewis Mfg. Co., Chicago; vice president, Arthur Roberts, president of the American Coal & By-Products Coke Co., Chicago; secretary, L. J. Miller; treasurer, P. C. Smith.

Metal Markets

Have Very Strong Tone—Spelter Prices Show Upward Tendency

New York, April 11.—The metal markets generally have reflected an exceedingly strong tone during the week, especially copper, which has been featured by the letting of several huge tonnages by the British government. This business, which involved approximately 320,000,000 pounds of copper, was distributed between the American Smelting & Refining Co. and the United Metals Selling Co., and, to a smaller extent, the Calumet & Hecla Mining Co. It is understood the prices paid were approximately 27 to 27.50c, f. o. b. New York, on the electrolytic copper, and shipment is to be made during the remainder of 1916. Aside from this business, the copper market is featured by a brisk demand, both from domestic and other foreign consumers. Prices on electrolytic are around 28.25c to 29c, delivered 30 days, for prompt and nearby shipment, and 27.25c to 27.75c, delivered 30 days, for shipment in July and the remainder of the year. Ordinary and arsenical lake copper are quoted nominally at 28.50c, cash, in the outside market for prompt shipment, and at 27.75c to 28c, cash, by the producers for June and July shipment. Ordinary casting copper is quoted at approximately 27c, cash.

The spelter market, while not active, continues to reflect a rising price tendency and a better demand. Prime western is quoted as follows: Prompt 18.75c to 19c, St. Louis; April 18.75c to 18.87½c; May, 18.25c; June, 17.50c; third quarter, 16.25c. Brass special spelter for prompt shipment is quoted at 22c, St. Louis.

Tin has been featured by further fears in regard to the future supply. It continues exceedingly difficult to get permits to export the metal from England in the quantities desired, with the result that sellers here are disposed to hold on to their stocks. Spot is quoted at 55c, New York. Future ex steamer prices are as follows: April, 54c; May, 94c; June, 48c; July, 47c; August, 46c, etc. Demand has been good of late both for spot and futures a rather heavy business in futures was the feature today.

The lead market is quiet, domestic consumers being well covered, and foreign demand having fallen off. Producers are well booked ahead, however, and in several cases, have nothing to offer prior to July. The market is quoted at 7.87½c to 8.12½c, St. Louis, and New York. Some of the second hands have been offering lead at 7.75c, but nothing for prompt shipment. The American Smelting & Refining Co. continues to ask 7.50c, New York, and 7.42½c, St. Louis.

The aluminum market is quiet. Outsiders are asking 59c to 61c on No. 1 ingots in carload lots.

Benzol Prices

Are Still Affected by Resale Lots—Market Generally Firm

New York, April 11.—Prices of principal coke oven by-products are held firmly by leading sellers, who are closing a fair amount of business. Offerings of resale lots, however, still are a factor and speculators and middlemen are able here and there to pick up odd quantities at some concessions. The offerings of this resale product are due largely to the delays of manufacturing users in getting new capacity started, causing them to market some of their current deliveries because their storage space is limited. Some selling of spot benzol under the figure of 80 cents, per gallon, quoted by leading sellers, have been done. The market, however, shows no real weakness as demand is strong. Some buyers have been making a strong effort to shade 70 cents, per gallon, at the plant, on contract benzol, asked by large sellers. In one instance, an offer of 68 cents, per gallon, at the plant, or 69c, New York, was made for a large quantity, but was refused. There were also some offers by buyers of 68 cents, per gallon, the past week. The tuluol market is quieter both on spot and contract and demand and supply are well balanced. The requirements of manufacturers of trinitrotuluol appear to be well covered and any strong effort of makers to sell probably would require the naming of prices sufficiently attractive to invite speculative buying. One maker offering futures in the market the past week, received bids of $3.90 per gallon, at the ovens. The larger sellers of tuluol continue to quote unchanged $4.75, at maker's plant, on spot, and $4.50, on contract. There is no change in the solvent naptha situation.

Inquiry for sulphate of ammonia has continued to show some increase, but it has been accompanied by some further weakening of prices, due to resale offerings. Buying of fertilizers by the farmers has dragged and the season this year probably will be prolonged through April. A new contract movement in sulphate among the manufacturers of fertilizers is not expected before 30 days more.

The current quotations per gallon at the maker's plant on leading coke ovcn by-products are as follows:

Commercial benzol, spot	$0.80 to .90
Commercial benzol, contract	.70
Tuluol, spot	4.75
Tuluol, contract	4.50
Solvent naptha, spot	.45 to .50
Solvent naptha, contract	.40 to .45

Sulphate of ammonia is $3.50 to $3.55 per 100 pounds at tidewater.

Extensions to the open hearth capacity of the Washburn Wire Co., Phillipsdale, R. I., are being carried out at the present time. These will increase the output of open hearth steel of the work to approximately 40,000 tons, annually, or an enlargement of about one-third.

Made Cleveland Manager

Walter B. Smyth, who has been district sales agent at Cleveland for the Cambria Steel Co. since April 1, 1913, has been appointed manager of sales of the Cleveland district for the Midvale Steel Co., Worth Bros. Co. and Cambria Steel Co. The Cleveland offices on June 1 will be removed from the eighth floor of the Citizens building to the ninth floor of the Swetland building, 1016 Euclid avenue. Mr. Smyth has been with the Cambria Steel Co. for 21 years, entering the Philadelphia offices in 1895 as an

WALTER B. SMYTH

office boy and going through various clerkships until in 1904 he was named assistant to the manager of the Cleveland district sales offices.

Blast Furnace and Coke Plant

The Whitaker-Glessner Co., Wheeling, W. Va., plans to erect a 500-ton blast furnace at its Portsmouth works, Portsmouth, O. The stack will furnish pig iron for the open hearth department, consisting of seven open hearth furnaces. A by-product coke oven plant is contemplated.

The Reading Car Wheel Co., Reading, Pa., has received an order to supply 8,000 wheels for 1,000 gondola cars recently ordered by the Philadelphia & Reading railroad.

Great Gains

Made in Unfilled Orders While Shipments Are Making Record

By the further tremendous addition of 762,035 tons during March, the gain in the unfilled orders of the Steel Corporation during the past six months has been raised to the remarkable figure of 4,013,383 tons, or an increase in that period of approximately 75 per cent. This gain in unfilled business has been brought about while production and shipments have been at the highest rate in history. On March 31, the order-book of the Steel Corporation stood at 9,331,001 tons, compared with 8,568,966 tons on Feb. 29 and 5,317,618 tons on Sept. 30, or six months previously. The volume of unfilled business at the close of March was 1,408,234 tons, ahead of that on Dec. 31, 1906, which was the largest total prior to that of Feb. 29 of this year.

The unfilled orders of the Steel Corporation at the close of each month in recent years, showing the changes in tonnage and per cent are as follows:

Date.	Total.	Change, tonnage.	Change, per cent.
Mar. 31, 1916	9,331,001	762,035+	8.89+
Feb. 29, 1916	8,568,767	646,199+	8.16+
Jan. 31, 1916	7,922,767	119,547+	1.53+
Dec. 31, 1915	7,803,220	616,731+	8.58+
Nov. 30, 1915	7,189,489	1,024,037+	16.63+
Oct. 31, 1915	6,165,453	847,834+	14.06+
Sep. 30, 1915	5,317,618	409,163+	8.13+
Aug. 31, 1915	4,908,455	20,085—	0.04—
July 31, 1915	4,928,640	250,344+	5.35+
June 30, 1915	4,678,196	413,598+	9.69+
May 31, 1915	4,264,598	102,354+	2.46+
Apr. 30, 1915	4,162,244	93,505—	2.21—
Mar. 31, 1915	4,255,749	89,622—	2.06—
Feb. 28, 1915	4,345,371	96,800+	2.28+
Jan. 31, 1915	4,248,571	411,928+	10.74+
Dec. 31, 1914	3,836,643	512,051+	15.40+
Nov. 30, 1914	3,324,592	136,505—	3.94—
Oct. 31, 1914	3,461,097	326,570—	8.62—
Sep. 30, 1914	3,787,667	425,664—	10.01—
Aug. 31, 1914	4,213,331	54,742+	1.32+
July 31, 1914	4,158,589	125,732+	3.12+
June 30, 1914	4,032,857	34,697+	0.86+
May 31, 1914	3,998,160	278,908—	6.98—
Apr. 30, 1914	4,277,068	376,757—	8.09—
Mar. 31, 1914	4,653,825	372,615—	7.42—
Feb. 28, 1914	5,026,440	412,760+	8.95+
Jan. 31, 1914	4,613,680	331,572+	7.74+
Dec. 31, 1913	4,282,108	114,239—	2.59—
Nov. 30, 1913	4,396,347	117,420—	2.60—
Oct. 31, 1913	4,513,767	490,018—	9.79—
Sep. 30, 1913	5,003,785	219,683—	4.24—
Aug. 31, 1913	5,223,468	175,888—	3.03—
July 31, 1913	5,399,356	407,965—	7.03—
June 30, 1913	5,807,317	517,005—	8.18—
May 31, 1913	6,324,322	654,440—	9.38—
Apr. 30, 1913	6,978,762	490,194—	6.55—
Mar. 31, 1913	7,468,956	187,758—	2.45—
Feb. 28, 1913	7,656,714	170,654—	2.18—
Jan. 31, 1913	7,827,368	104,796—	1.32—
Dec. 31, 1912	7,932,164	79,281+	1.01+
Nov. 30, 1912	7,852,883	258,502+	3.40+
Oct. 31, 1912	7,594,381	1,042,874+	15.33+
Sep. 30, 1912	6,551,507	388,132+	6.29+
Aug. 31, 1912	6,163,375	206,296+	3.46+
July 31, 1912	5,957,079	149,773+	2.58+
June 30, 1912	5,807,346	56,363+	0.98+

J. G. Carroll, of the general engineering department of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., talked about Storage Battery Locomotives, April 11, before the Pittsburgh section of the American Institute of Electrical Engineers. The meeting was held in the rooms of the Engineers' Society of Western Pennsylvania, Oliver building, Pittsburgh.

Will Rush Bill Against Efficiency

Congressional Committee Expected to Make Favorable Report on Measure Which Penalizes Use of Scientific Methods of Shop Management

Makes Appeal for Support in Fighting Bill

Willis B. Richards, 43 Wall street, New York City, of the firm of Gunn, Richards & Co., production engineers and public accountants, was one of the committee of ten selected from various engineering societies to conduct a campaign against the Tavenner bill. Mr. Richards said to a representative of The Iron Trade Review:

"I think it may be safely said that in the opinion of the engineering profession and the manufacturing world, the Tavenner bill could be properly entitled 'A bill to penalize efficiency in the public service.' It undertakes to make a criminal of every officer of the United States who uses in a public establishment those methods which in thousands of private plants and in the arsenals controlled by the war department, have demonstrated over a period of years their unquestioned capacity to at once decrease the cost of production and increase the wages of employes. As Thomas Edison, the dean of American inventors, says of the measure, 'It is an attempt to prevent efficiency, and would be disastrous to labor and the public.'

"Yet if congress can be persuaded to make it a crime for a government officer to use these methods, the engineer and manufacturer who employs the same system in private establishments will likewise become a criminal in the opinion of the public.

"It is to call the attention of congress and the public to this vicious proposal to condemn efficiency and penalize progress that a committee of ten was spontaneously organized in the engineering profession to spread information concerning the nature and consequences of this measure, among the public and our legislators. To that end, our committee has made a public appeal for funds to prepare and distribute educational literature and permit the presentation of our judgment and evidence to the committees and members of congress that they may not be unadvised as to the meaning of this effort to make criminals of public officers who endeavor to better the public service by employing the most advanced methods known to the business world.

"If this appeal to our fellow citizens and to our law makers to prevent the condemnation of the most progressive knowledge and skill by statute, is reprehensible, then we confess no proper conception of either our rights or our duties as American citizens."

Washington, April 11. — Further consideration of the Tavenner bill, prohibiting scientific management in government establishments, is expected to be taken up soon by the house committee on labor. It seems improbable, however, that the committee will change its attitude from that taken recently, when it voted unanimously to order the measure reported favorably to the house. The plan evidently was to have the bill taken up and passed as quickly as possible, but manufacturers and others interested in maintaining efficiency in industry learned of the action of the committee and asked for and secured a hearing on the measure. The only hearing which had been held previously was devoted to one witness, Representative Tavenner, author of the measure.

In granting a hearing to those opposed to the bill, the committee apparently did so only in a perfunctory manner. The character of the questions asked by committee members of witnesses protesting against the measure denoted anything but a friendly attitude toward these particular witnesses. Regardless of the fact that those fighting to maintain industrial efficiency riddled every argument made against scientific shop management, the committee members appeared to be obdurate. Instead of considering the logic of these arguments, committee members repeatedly asked questions which, it was plain, were designed to bait witnesses rather than to secure information. It smacked of a heckling process that almost bordered on persecution. Catch questions were resorted to in an effort to involve opposing witnesses and to combat their contentions.

When Brig. Gen. William Crozier, chief of ordnance, war department, was before the committee opposing the bill, he referred to the different arguments made by organized labor against scientific shop management, but asserted emphatically that he could "knock down these straw men as fast as they could be erected". And his direct, unanswerable testimony proved the truth of his assertion.

Committee Decidedly Partial

The unfriendly attitude taken by members of the committee against opponents of the measure was in striking contrast to the remarkably sympathetic attitude taken toward members of organized labor who gave testimony. Not only did committee members sit and listen patiently to the assertions made by organized labor witnesses, but they asked questions obviously meant to lead the witnesses further in their condemnation of scientific shop management.

To any unprejudiced listener it was easily observable that those opposing the bill had made out a case which was not injured by any argument of the proponents of the bill. James A. Emery, representing the National Association of Manufacturers; Henry R. Towne, of the Yale & Towne Mfg. Co.; Sanford E. Thompson, efficiency engineer; R. A. Feiss, of the Clothcraft Shops, Cleveland; R. A. Richards, efficiency engineer; William Kent and a number of others who appeared before the committee in opposition to the bill, gave clear and convincing testimony to show the tremendous benefits arising to employes and employers alike through the operation of scientific shop management in industrial plants. They outlined the origin of the various systems, their results, the ambitions of those who had created them and the growth of industrial efficiency. They urged strongly that the committee by passing the bill would put a tremendous premium on inefficiency in industry. Members of the committee who argued that the bill was not directed at private plants, were told plainly that to eliminate the efficiency systems from government establishments would mark the beginning of a campaign to do away with them in private plants. Moreover, it was asserted that the provision in the bill providing a fine or imprisonment for officers permitting the use of scientific management in government establishments was an indirect way of condemning as criminals all of those using or installing that system in private plants.

A. S. M. E. Meets in South

Mechanical Engineers Open Spring Session at New Orleans—Interesting Papers Presented

New Orleans, April 12. (By wire.)—With an unusually large attendance, particularly from the south and southeast, the annual spring meeting of the American Society of Mechanical Engineers opened Tuesday evening with an informal reception at the Hotel Grunewald. At the first professional session, which was held Wednesday morning, the subject of industrial preparedness from the standpoint of the engineer was discussed from almost every angle. The chief feature of this portion of the program was a paper entitled "Organizing for Industrial Preparedness," by Spencer Miller, Lidgerwood Mfg. Co., New York. This paper, which is published elsewhere in this issue, presents a practical method of organizing the manufacturing industries of the country for service in case of war.

The meeting will continue until Friday evening, April 14. Professional sessions will be held Thursday and Friday mornings, the afternoons being reserved for entertainments and excursions. The annual reception and dance, which is always a feature of the spring meetings, will be held Thursday evening, April 13. Among the papers of special interest to the iron and steel industry, which are to be presented at the Friday morning session, are the following: "Establishing a Standard of Measurement for Natural Gas in Large Quantities", by Francis P. Fisher, general manager Wichita Natural Gas Co., Bartlesville, Okla.; "Deviation of Natural Gas from Boyle's Law", by Robert F. Earhart and Samuel S. Wyer, consulting engineer, Columbus, O.; "The Transmission of Heat in Boilers", by E. R. Hedrick and E. A. Fessenden, associate professor mechanical engineering, University of Missouri, Columbia, Mo., and "Disastrous Experiences with Large Center Crank Shafts", by Louis Illmer, chief engineer Lake Heat Engine Co., Milford, Conn.

Railroads Order Cars

New York, April 12. (By wire.)—Some important new car business has been placed. The southern railway has closed for 1,500 box cars with the Mt. Vernon company and 1,000 with the American Car & Foundry Co. The Erie has placed 500 gondolas additional with the Standard Steel Car Co. The Pittsburgh, Shawmut & Northern has ordered 250 hoppers from the American company. Scattered orders call for 200. The Anaconda Copper Co. inquires for 250 cars of various types. The Chicago & North-Western has withdrawn its inquiry for 200 box cars because of high prices.

It is reported that the Midvale Steel & Ordnance Co. has taken 100 howitzers from the British government involving $2,500,000 to $3,000,000, but no official statement is forthcoming on this matter.

Canton Foundry

Has Been Acquired by the Morgan Engineering Co.

In order to be self-contained, the Morgan Engineering Co. has just acquired the plant of the Canton Steel Foundry, which is located on the Wheeling & Lake Erie railroad, Canton, O., with additional switching connections with the Pennsylvania and the B. & O. railroads. This plant has recently made an addition to its molding floor, 65 by 400 feet and is served by 11 overhead traveling cranes. It has an independent supply of water and the plant covers a tract of 15 acres. It has a dumping ground for slag and other steel foundry refuse. The Canton plant will add about 500 men to the pay roll of the Morgan company. It is equipped with two open hearth steel furnaces, one of 25-ton capacity and one of 35-ton. This acquisition will make the Morgan Engineering Co. independent so far as the supply of its material is concerned, as it already has a large brass foundry, iron foundry, forge plant and completely equipped structural and steel fabricating plant in Alliance.

In addition to modernizing and electrifying its machine tool plant, the Morgan Engineering Co. has just completed one of the largest and best equipped erecting shops in the country. This new erecting shop is served by a 100-ton crane on an upper runway and four cranes on lower runways, one of the latter being of 40-ton capacity, two of 25-ton and one of 10-ton, all running on the same track. This building is 95 feet wide by 600 feet long and is of all-steel and glass construction, with an additional connecting building 100 by 200 feet of the same general construction to be used for a brass machine shop, electric shop and general store room. By these changes the Morgan company has been able to create three machine shops of the following sizes: 65 by 480; 65 by 300; and 78 by 275. In addition to these changes, it has recently doubled the drafting room size by the addition of a new building of all steel and glass construction.

With the above additions it is interesting to note that the company is installing one of the largest planers in the world, made by the Niles-Bement-Pond Co., originally designed for the famous Creusot works in France, which is to France what the Krupp plant is to Germany.

The company has also added a further complete equipment of vertical and horizontal mills, drill presses, etc. This gives the Morgan Engineering Co. an equipment which cannot be excelled by any similar concern in America. It is now able to handle single pieces of machinery as large as the railroads are able to transport.

By-Products

And Other Subjects to be Discussed by American Iron and Steel Institute

New York, April 11.—A tentative list of the papers to be presented at the spring meeting of the American Iron and Steel Institute to be held at the Waldorf-Astoria, New York City, May 26 and 27 has been determined upon by the committee in charge. The list is as follows:

"By-Products Recovered in the Manufacture of Coke," W. H. Childs, president, Barrett Co.

Discussion, W. H. Blauvelt, Semet-Solvay Co., Syracuse, N. Y.

"The Electric Furnace in Steel Manufacture," Dr. John A. Mathews, president, Halcomb Steel Co., Syracuse, N. Y.

Discussion: R. F. Flinterman, Michigan Steel Co., (Heroult); L. E. Howard, Simonds Manufacturing Co., (Girod and Heroult); Robert M. Keeney, Snyder Electric Furnace Co., (Snyder); W. G. Kranz, National Malleable Castings Co., (Heroult).

"Rail Manufacture," Dr. John S. Unger.

Discussion: H. C. Ryding, assistant to vice president, Tennessee Coal, Iron & Railroad Co., representative Bethlehem Steel Co.

"The Distribution of Materials in the Blast Furnace," Geo. W. Vreeland, superintendent blast furnaces, Carnegie Steel Co., Mingo Junction, O.

Discussion: A. N. Diehl, Duquesne, (Neeland Top); J. C. Barrett, Youngstown, (McDonald Top); A. J. Boynton, Central and Lorain, (McKee Top); R. C. Glazier, Cambria, (Slick Top); H. A. Brassert, South Chicago, (Plain Double Bell); K. Landgrebe, Ensley, (Brown Top).

Evening.

"The Hell Gate Bridge," (Illustrated), Jacob Loewenstein, Engineer, American Bridge Co., New York.

The American Bridge Co. has taken 3,500 tons for a hotel at St. Louis, to be erected by the Statler Hotel Co.

Converter Foundry for Varied Work

IN POINT of output and variety of work handled, converter shops throughout the country have equalled the foremost jobbing foundries. The Reading Steel Casting Co. has developed an efficient plant for making castings from converter steel. This article describes the ingenious devices used to facilitate operations

THE past few years have witnessed a tremendous growth in the number of converter steel foundries in the United States. This remarkable expansion has been due to a variety of causes among which the ability of converter operators to handle a constantly wider range of work, due to increased technical skill, has been prominent. Also, as technical problems have been mastered, the business opportunities in the field have grown larger, with the result that today there are several converter shops in the eastern section of the United States that rank with the foremost jobbing foundries of the country in point of output and variety of work handled.

Melting Department Equipment

Among the plants of that character is that of the Reading Steel Casting Co., Reading, Pa.; this corporation, which is the successor to the Brylgon Steel Casting Co., dates from 1906. The melting department of the Reading Steel Casting Co.'s plant comprises two cupolas and four converters of the company's own design, placed along one side of the main foundry bay. The larger cupola, in which the converter charges are melted, runs continuously and has a melting capacity of eight tons per hour. This is equivalent to four converter charges, since each converter has a capacity of two tons. The converters are tilted electrically and are controlled from a platform placed across the main bay in such a position that the operations may be readily observed. Oil burners are provided for baking the linings prior to a series of blows. It is customary to operate the converters in relays; according to this plan, two converters are used each day, turning out two heats, or four tons of steel, each, per hour. With this equipment, the company can pour 1,400 tons of steel a month and allowing 50 per cent for shrink heads, sprues, etc., the maximum output of finished castings is approximately 700 tons a month; this is nearly equal to the output of an open hearth foundry equipped with a 20-ton furnace.

The smaller cupola, which has an inside diameter of 36 inches, is employed for melting the mixtures of ferro-manganese and ferro-silicon used to recarburize the heats after blowing. Owing to the high prices now ruling on ferro-manganese, the company is making extensive use of spiegeleisen as a substitute. The only steels which are not recarburized by the addition of such a mixture are those which are specified under 0.10 per cent carbon and without manganese or silicon. To meet such special requirements, the steel is removed from the converters as blown, sufficient aluminum being added to remove the oxides. Low phosphorus pig iron containing approximately 1 per cent copper is used extensively. The metal mixtures contain from 40 to 50 per cent pig iron with 60 to 50 per cent steel scrap. It is stated that tests of the resulting steel, containing approximately 1 per cent copper have shown exceedingly satisfactory physical characteristics. This seems to controvert the contention that copper is a deleterious element when present in such large quantities.

Methods of Molding

Snap flask molding is employed very extensively, all but the very heaviest castings being produced by this method. The snap molds are made on the

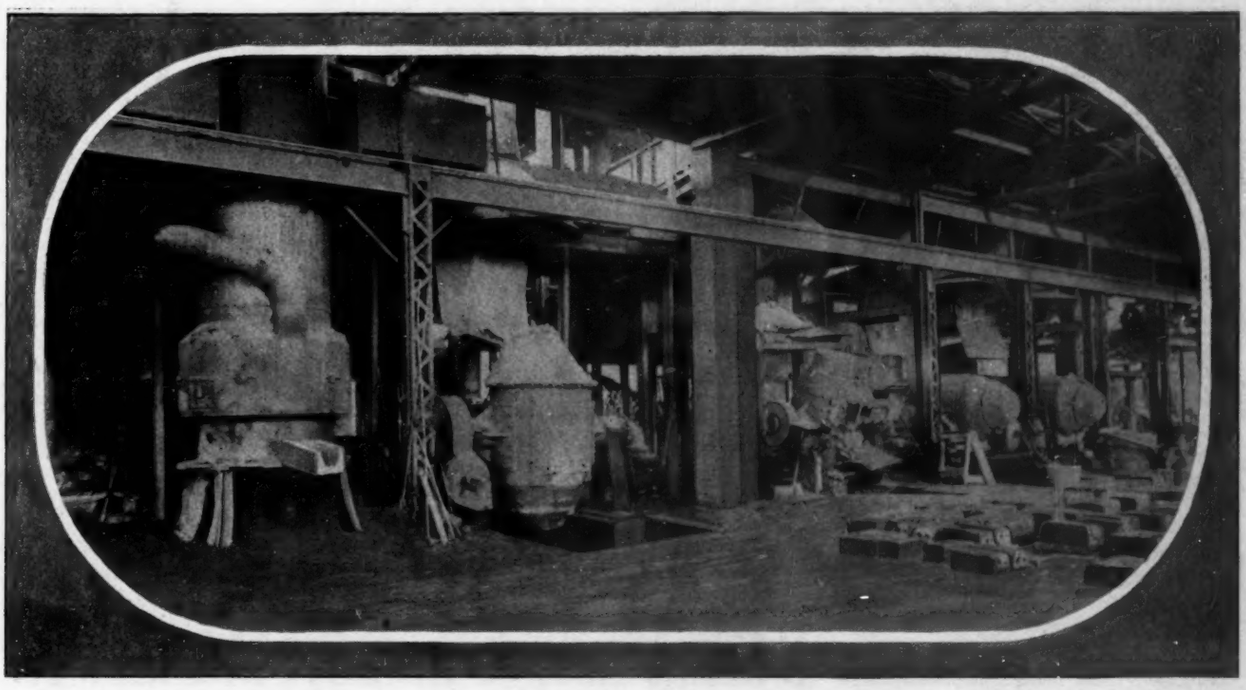


FIG. 1—MAIN BAY IN FOUNDRY SHOWING MELTING EQUIPMENT COMPRISING TWO CUPOLAS AND FOUR CONVERTERS

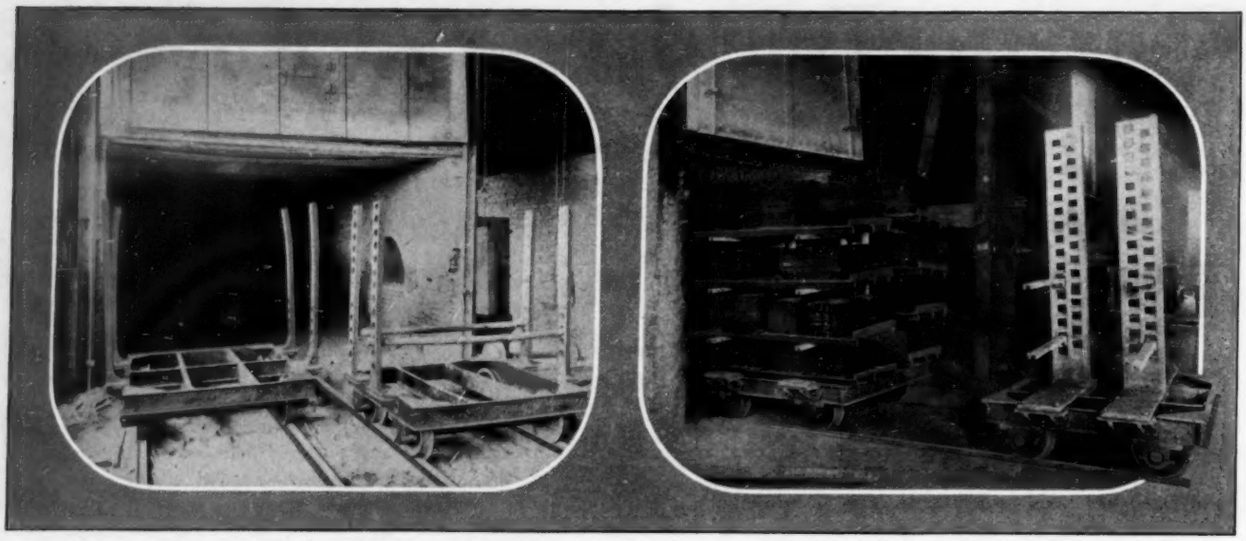


FIG. 2—DOUBLE TRACK MOLD DRYING OVEN SHOWING TYPE OF TRUCK WHICH MAY BE BUILT-UP TO SUIT THE LOAD

FIG. 3—IMPROVED TYPE OF TRUCK USED IN MOLD DRYING OVENS TO SAVE SPACE

floor, on benches and on molding machines. The molding machine equipment in the snap flask department includes 16 power squeezers with cylinders ranging from 12 to 16 inches in diameter, and two jolters with 4-inch cylinders. The core shop is equipped with three 3½-inch jolt machines and an 8-inch jarring machine also has been provided for handling large work.

Practically all the molding is done on match-plates or with plain patterns. The snap flasks range from the usual small sizes up to 7 feet in length. When not in use, they are kept in a separate store room which is in charge of one man who keeps the flasks in repair. To get a flask, the molder must leave one in its place; thus all the flasks are continuously accounted for and none is left lying around the foundry where they take up valuable space.

Handling Snap-Flask Molds

The rigging which the company has devised for handling snap-flask molds is exceptionally interesting and permits of an extremely large output without congesting the molding floor. After being rammed, the snap molds are deposited on steel bottom boards, which are placed on specially constructed angle iron frames. These frames are 24 inches wide and 6½ feet long; each one will hold from one to five molds, depending on their size. As fast as the frames are covered with molds, they are loaded onto trucks and wheeled into the drying ovens. The frames are easily transferred to a rigging employed for carrying them to the drying ovens. This rigging consists of hooks, supported on both ends of an equalizer beam which, in turn, is suspended from a hoist. The six hoists, which have a capacity

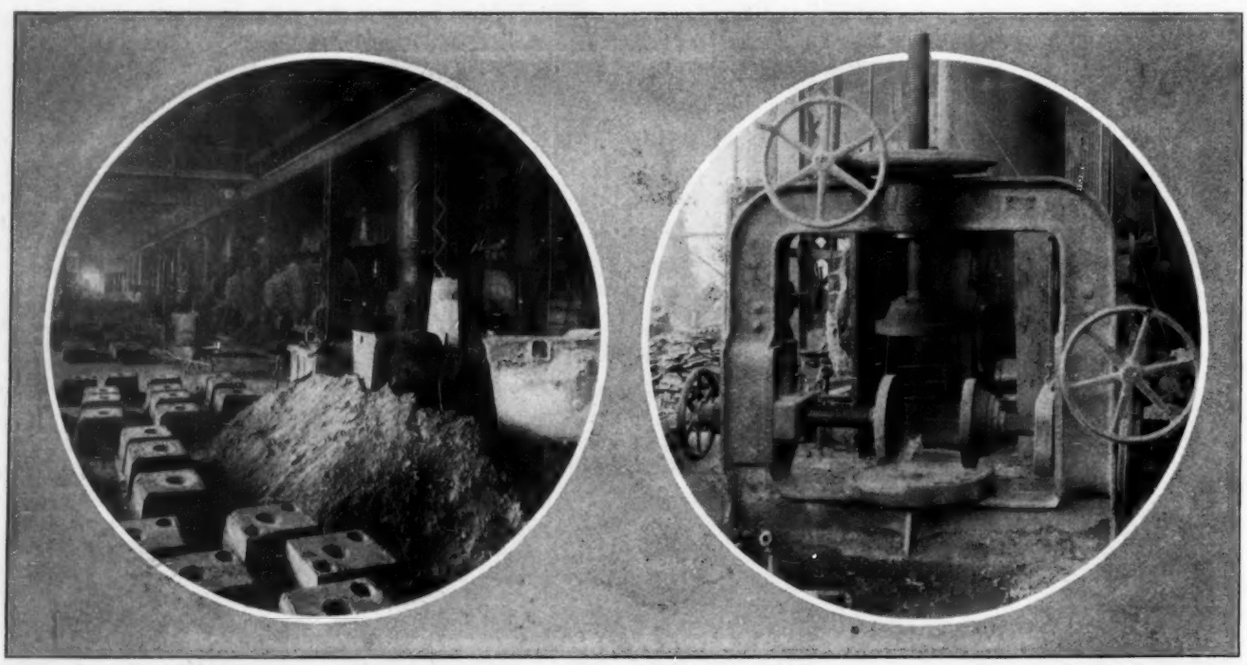


FIG. 4—STEEL BOXES LOADED WITH FRESHLY MIXED SAND. THESE BOXES ARE TRANSFERRED TO THE MOLDING FLOORS BY CRANES

FIG. 5—SPECIAL MACHINE FOR HYDRAULICALLY TESTING VALVE AND FITTING CASTINGS

of two tons each, are of the Shepard type, and are mounted on an overhead tramrail system which commands the entire floor space, 50 x 110 feet, in the snap molding department. The cranes may be transferred readily from one branch of the overhead system to another as required, thus affording great flexibility of service.

Special Trucks for Drying Ovens

The snap molding department is provided with three coal-fired mold drying ovens. One, which is of the double-track type, accommodates eight trucks. The other two are provided with single tracks and have a capacity for four trucks each. Of particular interest are the two types of trucks employed. These are designed to take the maximum possible load, thus filling all the space in the ovens except such as must be left to permit the heat to circulate between the molds. The trucks, as shown in Figs. 2 and 3, are provided with low platforms, the molds being placed on racks which are inserted in the vertical columns. The upright members, in both types of trucks, are cast steel. In the truck shown in Fig. 2, the horizontal members of the rack consist of lengths of 3-inch wrought pipe. Due, however, to the constant warping of the pipe, the truck shown in Fig. 3 was designed and is said to have rendered exceedingly satisfactory service. This truck is provided with two vertical columns in each of which two parallel rows of slots are provided; the brackets are fitted into these slots as desired, and are held firmly in place by means of upper and lower flanges which securely grasp the tops and bottoms of the slots.

A separate portion of the foundry, 68 x 240 feet, is devoted to the production of large castings, such as motor truck and tractor parts, crank shafts, large valves and fittings for steam superheaters, and other pieces not suited to snap molding. A large proportion of this work is molded on a 3-ton jolt-ramming machine, which is served by a 1½-ton hoist suspended from a swinging boom. For the regular floor work, pneumatic rammers are used throughout.

This department is provided with two large drying ovens and is commanded by two 10-ton electric traveling cranes and 2-ton Shepard traveling hoists. It has a concrete floor, as has the snap-mold department. Adjoining the floor-molding department is the core room, which is 50 x 62 feet in size. Practically all the cores are made on jolters, of which there are three in the core room, as mentioned previously. The core department, which is commanded by a 2-ton electric traveling crane, contains a machine for automatically mixing oil sand and also is provided with an oven of the drawer type. The oven is 36 x 8 x 8 feet; it contains 48 compartments, each of which may be opened and loaded without interfering with any of the others.

A 40 x 200-foot section of the main bay, in which the converters are located, is reserved for pouring the molds after they have come from the drying ovens. Practically all the work is poured with bottom-pour ladles, each of which will accommodate a full converter charge. This bay is commanded by three 10-ton electric traveling cranes, by which the ladles not only are transported to all parts of the pouring bay, but may be transferred, if desired, to either of the two molding bays which adjoin the pouring bay.

Relining Ladles

An unusual rig, designed for saving floor space, is that employed in relining and repairing the ladles. It consists essentially of a system of ball-bearing trucks on which the used ladles are deposited by the cranes and by means of which they are transferred from the main bay to a special compartment where they are put in shape for the next day's heat. These trucks are provided with circular steel platforms mounted on four wheels.

The cleaning department occupies a portion of the main foundry building. In addition to a 6 x 4-foot square tumbling barrel, two sand-blast chambers, several oxy-acetylene welding sets, sprue cutters, cold saws and a large number of stationary grinders and portable pneumatic chippers, the equipment includes four portable grinders of special design, which were developed by the company for its own use. As shown in Fig. 12, these machines are mounted on wheels, and are provided with a frame which supports a motor and grinding wheel in such a manner that they partly counterbalance each other. The motors, which are rated at 1½ horsepower

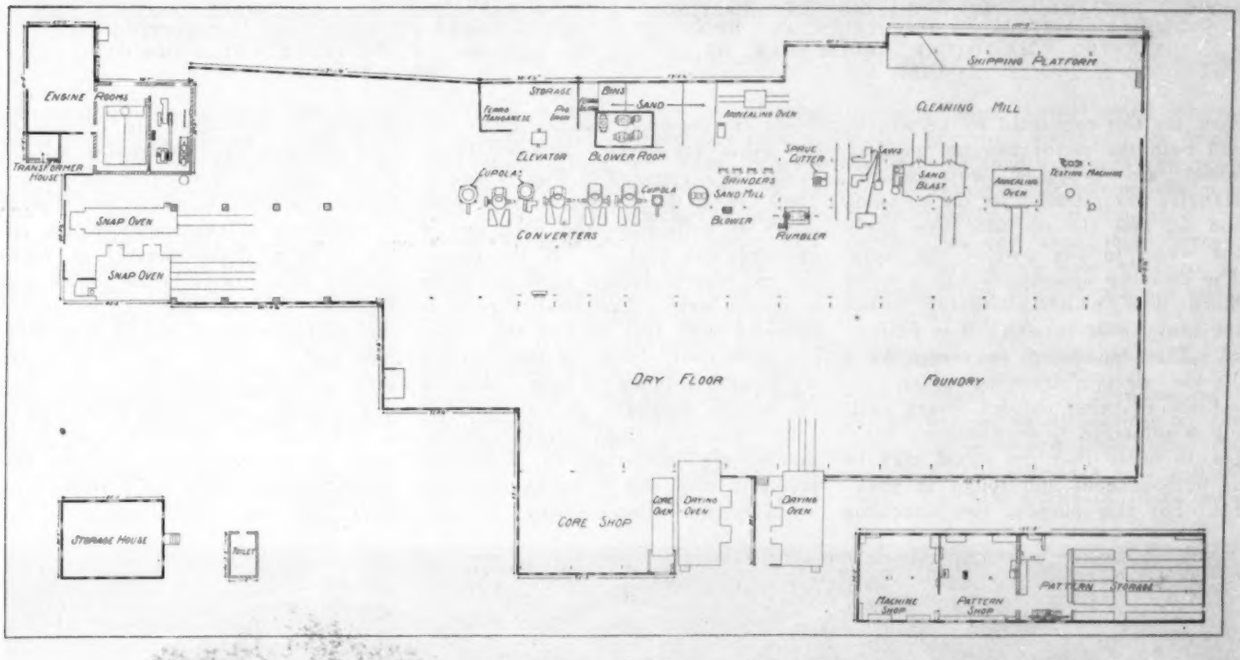


FIG. 6—GENERAL LAYOUT OF FOUNDRY OF READING STEEL CASTING CO., READING, PA.

FIG. 7—EQUIPMENT FOR ANNEALING LARGE CASTINGS —WHILE CASTINGS ON ONE TRUCK ARE BEING TREATED THE OTHER TRUCK CAN BE LOADED

FIG. 8—ANNEALING OVEN FOR SMALL CASTINGS—THIS OVEN OPENS AT BOTH ENDS, PERMITTING THE LOADING OF ONE TRUCK WHILE THE OTHER IS IN THE FURNACE

each, are belt-connected to the wheels, and both the motor and the grinding wheel are provided with guards. Handles are provided at the grinding end so that the operator can apply the wheel to any part of the work. The cleaning department has a wood block floor which admirably resists the heavy wear to which it is subjected. This department is served by a 3½-ton electric traveling crane.

Prior to being shipped, every casting is subjected to an annealing process, in order that the metal may be as homogeneous and tough as possible. For this purpose two annealing ovens are provided, one for small and the other for large castings. These ovens are illustrated in Figs. 7 and 8. They are of the continuous type with doors at both ends and each one is operated with fuel oil. In the larger, one car may be loaded while the other is in the oven. The smaller oven is operated with fuel oil and the larger one with coal. Some of the castings are treated with an oil bath. Most of the output, however, is air chilled.

All manufacturing plants, unfortunately, are subjected to occasional losses of time due to unexpected and unpreventable break-downs in machinery or equipment. In periods of light demand such difficulties do not entail serious consequences. When business is brisk, however, and a plant is operating at capacity, nothing, unless it is a strike, creates as much dismay as a serious break-down. The Reading Steel Casting Co. has given this subject a great deal of consideration and in order that such delays shall not consume any more time than is absolutely unavoidable, it has laid in a full line of materials and spare parts for making repairs. These materials, together with the ordinary supplies, are kept in a two-story and

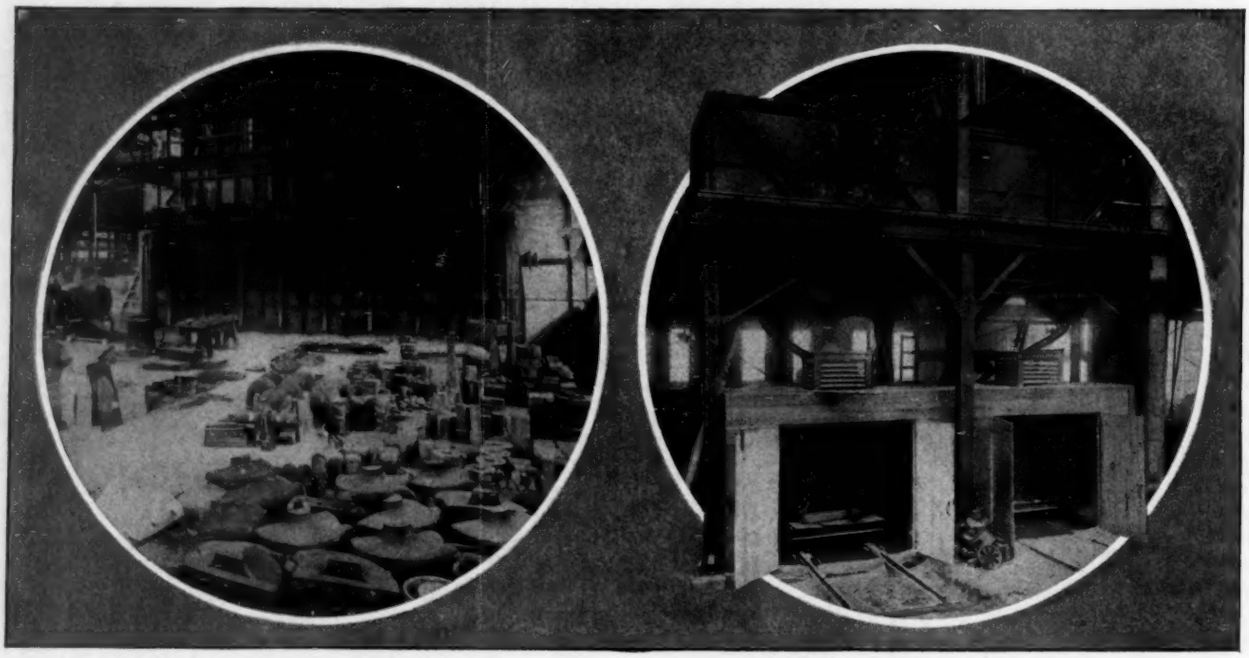


FIG. 9—FRONT VIEW OF LARGE CORE OVEN OF THE DRAWER TYPE

FIG. 10—SAND BLAST CHAMBERS SHOWING OVERHEAD SAND STORAGE BINS OF LARGE CAPACITY

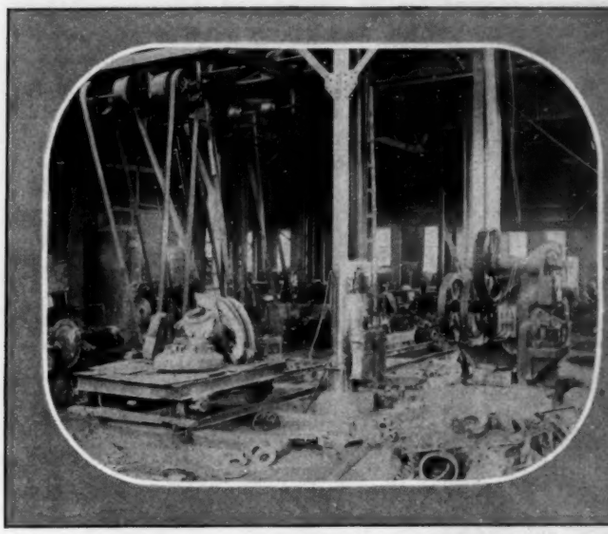


FIG. 11—PORTION OF CLEANING DEPARTMENT SHOWING MACHINES FOR REMOVING GATES AND SPRUES FROM CASTINGS

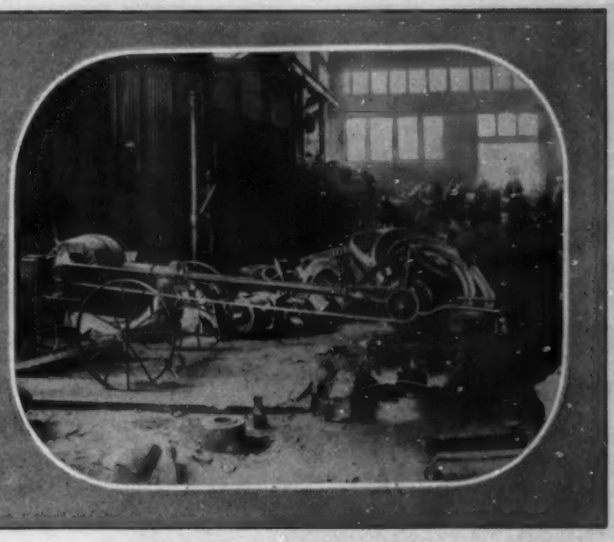


FIG. 12—PORTABLE, SWING FRAME GRINDER ESPECIALLY SUITABLE FOR FINISHING CASTINGS THAT HAVE BEEN WELDED BY THE OXY-ACETYLENE PROCESS

basement storage building. The stores department is in charge of one man, who gives out the materials only on properly signed requisitions.

Promoting Safety

A portion of this building is occupied by the physical and chemical testing laboratories. The former contains a Riehle testing machine and a lathe for machining test parts. The chemical laboratory includes the usual apparatus required for iron and steel analysis.

The company originally encountered considerable difficulty in persuading its employes to make proper use of safety devices. For instance, the men at first were prone to wear goggles in their hip pockets, until one of them lost an eye which the goggles would have saved. This unfortunate accident had a salutary effect and since then goggles have been worn willingly by all workmen to whom their use is recommended. Weaning the molders away from the use of shoes which are unfit for foundry work also proved rather difficult. When the company originally laid in a stock of shoes of the type developed by the National Affiliated Safety Organizations, the men showed small interest in the improved footwear. It finally was decided to distribute a few pairs free of charge, thus paving the way to an appreciation of the shoe. So popular has this shoe since become that the company now sells to its employes from 30 to 40 pairs a week, at cost prices.

Welfare and Relief Association

In addition to the encouragement of the use of safety devices in the shops, the company looks after the welfare of the employes in a general way. Fig. 15 shows a large new

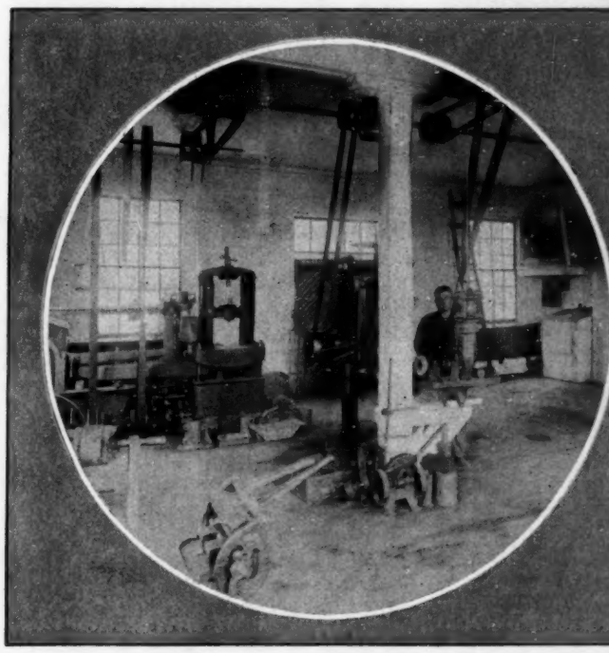


FIG. 13—PHYSICAL LABORATORY SHOWING RIEHLE TESTING MACHINE

FIG. 14—CHEMICAL LABORATORY EQUIPPED FOR IRON AND STEEL ANALYSIS

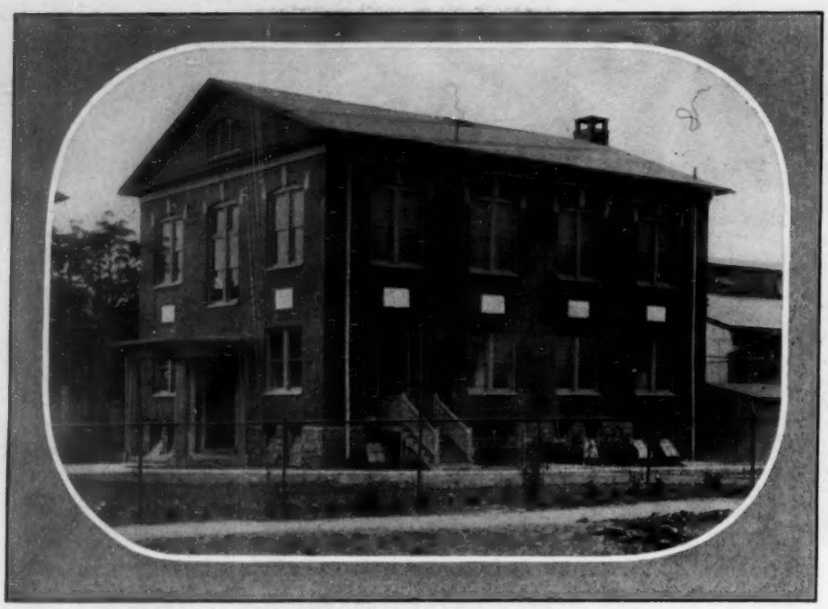


FIG. 15—HOME OF READING STEEL CASTING RELIEF ASSOCIATION

building recently erected at a cost of $12,000 to take care of the work of the Reading Steel Casting Relief Association. This is an organization of employes that provides sick benefits, etc., for its members. This building is believed to be one of the finest of its kind in the country. The basement contains hot and cold shower baths, wash basins, lockers, etc., enabling every workman at the plant to remove all signs of labor at the close of the day, and to change his clothing and go home refreshed and rehabilitated. The first floor contains a billiard and pool room, a co-operative store, a reading room supplied with current issues of a number of trade papers and most of the popular magazines, a completely equipped kitchen and a hospital. The assembly hall occupies the entire second floor. This is provided with a platform at one end and is suitable for a great variety of purposes. The appreciation of the employes is measured by the extent to which they use the building during most of their hours of recreation. In addition, their wives use it freely during the day. In this way the building serves a dual purpose, making it possible for every member of the family to participate in and enjoy this novel feature of welfare work, to the fullest extent.

In a democracy such as ours an interesting feature is the development of aristocrats; of wealth, labor, politics, arts, science and industry. The true aristocrat's position is the reward of merit. We also develop the mental plebian—often voting him into an office of trust just to show how really democratic we are. It is an amusing contradiction.

Chemistry of Oxygen's Effect on Cast Iron

BY W. McA. JOHNSON

THE work of J. E. Johnson Jr. on the effect of small amounts of oxygen in cast iron in increasing its strength and resistance to shock, is of interest from the technical scientific standpoints. The following exposition of the theory carries Mr. Johnson's explanation further and, in my opinion, will disclose certain related phenomena and perhaps shed further light on the subject.

Some facts, so novel in character as to excite incredulity, have been accepted finally by many metallurgical authorities. One of these is that oxygen to the amount of 0.060 per cent in cast iron gives it a breaking strength of 3,500 pounds per square inch, compared with a breaking strength of 2,500 pounds per square inch in cast iron of the same composition with respect to elements other than oxygen, but having only 0.010 per cent oxygen. The "oxygenated" cast iron, even if made in a coke furnace, has properties equivalent to the best charcoal pig iron. Mr. Johnson has also established the fact that the variations in combined carbon cannot account for the results. By microphotographic evidence he has shown that in oxygenated cast iron the graphite particles are dense and spherical, while in well-deoxidized cast iron the graphite particles are flaky and leaf-like. It is just a matter of common sense that iron of the latter structure is much weaker than the former. The analytical and microscopical work has been done with care and there is no doubt in my mind about the accuracy of the experimental results. In this paper then, we shall consider it as accepted that small amounts (0.060 per cent) of oxygen increase the strength of cast iron by producing a structure in which the round and solid particles of graphite are surrounded firmly by a principal matrix of ferrite.

The purpose of this paper is to show that the reason why the graphite particles are round is founded on the fact that the particles of any precipitate are made denser and harder by the presence of a reagent having a solvent action on the precipitate. This can be stated as a law, although I have never seen it so given in any textbook. Let us, then, for illustration, give a concrete example and develop the theory of such mechanical and chemical actions as occur.

It is well known that, by a soluble sulphate, a barium salt in solution is precipitated in a dense and easily filtered body when the solution is strongly acid with hydrochloric acid, while in a neutral solution barium sulphate is thrown down as a flocculent body. The same is true of silver chloride precipitated out of a silver nitrate solution by hydrochloric acid with nitric acid as the excess reagent. If we increase the proportion of hydrochloric acid in the case of barium sulphate, and the nitric acid in the case of silver chloride, the precipitate is thereby made dense and easily filtered. In any case, the mechanism of the operation is the same, provided a sufficient interval of time be given to allow the mechanistic operation to proceed to equilibrium.

It may be remembered that this equilibrium is not a static, but rather a kinetic one. By this it is meant that an interchange of molecules from the solid to the solution is continuously taking place. We have the velocities of the two reactions that

Presented at the recent New York meeting of the American Institute of Mining Engineers.

take place as equal and opposite. Then we have, as is well known, the two equal and opposite reactions:

1. $AgNO_3 + HCl = AgCl + HNO_3$ Velocity $= V_1$
2. $HNO_3 + AgCl5AgNO_3 + HCl$ Velocity $= V_2$

The first form of any precipitate is particles of molecular fineness. If these particles subsequently agglomerate, they agglomerate in long dendritic forms, in accordance with the probable effect of a weak force of cohesion acting on an infinite number of solid particles. In general, the velocity indicated above as V_1 is less than V_2, and then the precipitate would be dissolved; on the contrary, whenever V_1 is greater than V_2, precipitation would take place.

Considering now a case when V_1 is greater than V_2 and precipitation is taking place, and a particle having a body terminating in a point: It is obvious that the instantaneous effect of V_1 would be less on the point of such a particle than it would be about the center, on account of the law of mass action. Therefore, the particle would tend to be dissolved at the point and would then tend to be reprecipitated near the center of cohesive force of each particle. These interchanges would be comparatively rapid at first and then slower, but the general effect would be that the precipitate would become more and more composed of particles of such shape and density that the force of cohesion would act more strongly as the molecules came into closer mutual relation.

The net effect of this would be that the particles of spherical shape would increase in size and density according as the magnitudes V_1 and V_2 were unequal instantaneously, or, explaining it in another way, according to the integrated heterogeneity of V_1 and V_2.

According to the law of mass action, an excess of HNO_3 would increase V_2 as compared to V_1, thus tending to convert the particles of irregular size into the form of a sphere.

Just this action occurs with oxygenated cast iron; we have the solvent action of oxygen on carbon with the production of carbon monoxide which is dissolved in the iron—we may even have the formation of iron carbonyl. We know that when liquid iron cools, graphite forms together with the eutectic. Any excess of oxygen above 0.010 per cent would cause an ebullition of gas, because the solubility point of carbon monoxide in iron would be overreached and there would ensue the steelmaking reaction:

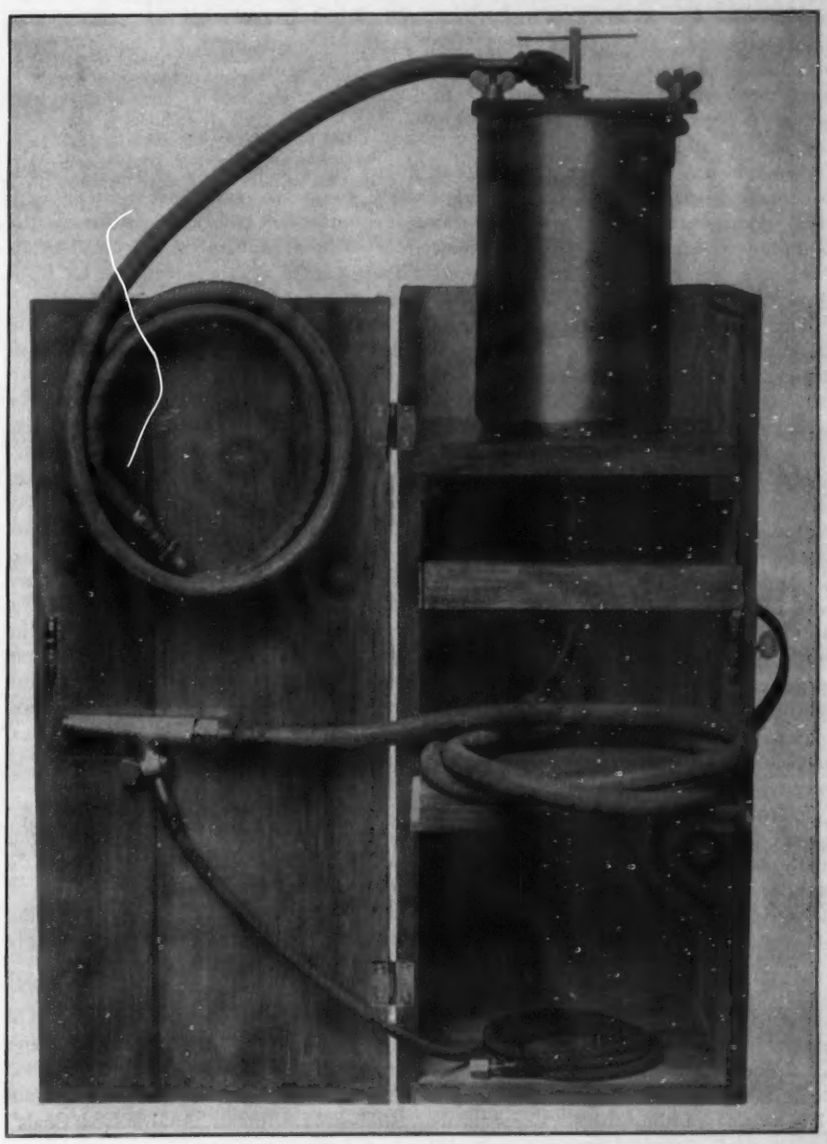
$$FeO + Fe_3C = 4Fe + CO$$

It can easily be seen that the percentage of oxygen must be exactly that called for by the physical chemical effect, and it is a great credit to Mr. Johnson that he has learned this by empirical methods. His deduction from *a priori* reasoning, based on premises calculated from many isolated phenomena, is a brilliant intellectual feat, as is his experimental proof.

It may be that further work on the effect of oxygen in cast iron will lead to the conclusion that a certain percentage of oxygen will improve steel. Possibly reagents other than oxygen might be used. As developed in this paper, the application of a chemical theory to the question of the size of particles of the several components of cast iron and steel has attractive possibilities ir the domain of both pure and applied science.

Coating Metals With Zinc

AN INTERESTING instance of adapting a process to changed conditions is found in a new apparatus for coating metals with zinc film. The Metals Coating Co. of America has developed the Schoop metal spraying process in which zinc wire or other metal wire is melted in a gas flame and projected under pressure onto the surface to be coated. Under present conditions in the metal market this wire has become exceedingly expensive. To fill the need for a less costly process the apparatus shown in the accompanying illustration has been devised. It consists of a conical receptacle, shown at the top, which has another similarly shaped receptacle inside, with a small space between. Zinc dust is placed in the inner cone and



APPARATUS FOR SPRAYING ZINC DUST HEATED BY ACETYLENE FLAME

compressed air is admitted through the hose at the top to the space between the two cones. A valve at the bottom of the inner compartment allows the zinc dust to be caught up by the air current and carried to the spraying device, which is shown attached to the door of the cabinet.

Acetylene gas is admitted to the spraying device or pistol through the smaller tube and is ignited at the tip of the main nozzle, through which the zinc dust is blown from an inner nozzle. The heat of the gas flame is sufficient to melt the zinc dust and the air blast impacts the particles on the surface sufficiently to form a film. Adjustable valves regulate the quantity of zinc dust allowed to pass into the air current and also the quantity of gas used to melt the metal.

The apparatus weighs about 20 pounds and uses air at a pressure of about five pounds per square inch. Acetylene gas, the heating agent, is easily available and has been found to give good results with zinc dust. The present cost of zinc wire is about $1.25 per pound while zinc dust, which is a by-product of the zinc smelter, may be obtained at about 30 cents per pound. The apparatus is portable, which adds to its usefulness for work in the field in coating structural or bridge steel with a film of zinc to resist corrosion. Even at ordinary price levels the use of zinc dust is less expensive than wire, which considerably broadens the application of this method of coating and makes possible its use on much larger surfaces than when zinc wire is used in the pistol.

Standard Measurement for Natural Gas

TWO interesting papers dealing with the problems of properly measuring natural gas in large quantities are being presented at the meeting of the American Society of Mechanical Engineers at New Orleans, April 11-15. Francis P. Fisher, general manager of the Wichita Natural Gas Co., discusses the subject from the standpoint of a practical man who has been confronted with the problem in actual experience. An abstract from his paper follows:

Some three years ago the author became associated with the reorganized management of a natural gas pumping system in the mid-continent field. In the course of investigations preparatory to outlining a general policy, there was discovered between purchase and sales a loss of gas which seemed wholly unreasonable. The total loss could be made up from leakage in field lines, leakage in main lines, leakage in distribution systems, errors in large capacity meters, errors in domestic meters and errors in estimates of unmeasured gas.

The first step in eliminating this waste in various parts of the system was to provide an accurate gas measurement at strategical points. Manifestly the first problem was that of large capacity meter installation, and with part of the losses possibly due to meter inaccuracy, the first step was establishing a definite standard of accuracy in meters.

A catalog of the weaknesses and objections to all known and available methods was formulated. It was determined that the relative objections be weighed and one of the systems chosen as a standard to be developed to a closer degree of accuracy than heretofore available. The method chosen for development was the orifice meter, in the belief that the objections to the existing types could be overcome at less cost and more simply than to any of the others. Consequently the work done to establish a standard has been continued for approximately two and one-half years, and it has now passed the second phase of installing measuring stations to segregate and locate definitely the remaining leakage losses. There is no question but what any of the other methods of measurement than the orifice meter is capable of an equal degree of refinement.

Deviation of Natural Gas From Boyle's Law

In close connection with Mr. Fisher's paper on gas measurement is a description of laboratory work on the deviation of natural gas from Boyle's law given in a paper prepared by Robert F. Earhart and Samuel S. Wyer. Tests were made by the authors in the laboratory of the department of physics, Ohio State University Columbus, O., on eight representative natural gas samples from various parts of the United States, to ascertain by accurate volumetric measurement whether or not these natural gases did deviate from Boyle's law, and if so, under what conditions. The apparatus used and methods followed are novel, but accurate in detail. The data show conclusively that all of the observed deviations of natural gas from Boyle's law are in favor of the buying company where gas is measured under high pressure conditions. The different gases were found to have marked peculiarities and marked differences of deviation. There is no direct relationship between the deviation and ethane content; and the direct application of Boyle's law to high pressure natural gas measuring problems gives only an exceedingly rough approximation.

The bureau of mines, department of the interior, has issued an exhaustive study of the composition of various American coals under the title "Graphic Studies of Ultimate Analyses of Coals", by Oliver C. Ralston. The monograph, which is published as technical paper No. 93, contains 41 pages. In the preface it is stated that as an aid to the study of the constitution and origin of coal a systematic survey of a large number of chemical analyses of various coals is of undoubted value, but as a basis for classifying the different kinds of coal, its value may be questioned.

In the introduction to the monograph itself, the author states that the paper presents the results of a study of the most reliable published analyses of coal. The analyses are studies from several different angles, special trilinear coordinates based on the system proposed by Grout being used. The analyses are calculated to a moisture-free, ash-free, nitrogen-free and sulphur-free basis, so that the sum of the carbon, hydrogen and oxygen is 100 per cent.

A recent bulletin issued by the department of safety, sanitation, and relief of the Inland Steel Co., Indiana Harbor, Ind., shows comparative statistics of accidents in the mills and mines of the company. In 1915 there was a reduction of 5.68 per cent in the number of lost time accidents as compared with 1914. Since 1912, the decrease in accidents has amounted to 36 per cent. In 1915 the roll shop department of the Indiana Harbor works went through the entire year without having an accident causing a loss of time. At the mines, the number of accidents has been cut down 52 per cent since 1913.

An analysis of the causes of accidents causing a loss of time during 1915 shows that 42 per cent were chargeable to trade risks incidental to the industry; 0.02 per cent were due to dangerous conditions; 50.5 per cent were attributed to negligence on the part of the injured; and 7.3 per cent were the result of negligence on the part of others. This indicates that 57.8 per cent, or more than half, of the serious accidents were caused by some fault on the part of the human element, and were preventable.

Mobilizing Our Industrial Resources

IN CASE of war the industrial forces of a nation are fully as important as its military strength. With a view to preparedness, American engineers are organizing the industries for efficient co-operation in the manufacture of munitions of war. The plan includes a census of the nation's industrial facilities

BY SPENCER MILLER

THE President of the United States, speaking from his intimate contact with foreign affairs, recently said, "There may come a time when I cannot preserve both the honor and the peace of the United States." He also urged that we should be "very adequately prepared, not for war but for defense." Both Ex-Presidents Taft and Roosevelt have declared for the immediate and adequate preparedness of our army and navy. Our highly-trained army and navy experts, whose life work entitles them to speak with authority, have been most earnest for far more effective military defenses. The public press, reflecting largely public opinion, is overwhelmingly in favor of adequate preparedness.

With so formidable an array of authoritative opinion, engineers patriotically, quietly and earnestly ask the question, "What may we do to serve our country?" Engineers are for peace with honor and will make personal sacrifices to insure it.

It was a proud day for the engineers and scientists when Secretary Daniels of the navy department invited Thomas A. Edison and 11 engineering and scientific societies to form a civilian advisory board of 23 members to aid in mobilizing the engineering and industrial world for preparedness. This invitation was eagerly accepted and the naval consulting board is now fully organized with Mr. Edison as chairman. This board serves without monetary compensation, even paying its own expenses. It has resolved itself into committees, one of which, headed by Howard E. Coffin, is the committee on production, organization, manufacture and standardization. This committee formulated a plan for aiding in organizing American industries for preparedness, which, laid before the President, prompted him to invite the five leading engineering societies, whose combined membership is about 35,000, to effect such an organization. This he did by writing identical letters to the American Society of Mechanical Engineers, the American Society of Civil Engineers, the American Institute of Electrical Engineers, the American Institute of Mining Engineers and the American Chemical Society. Each society named has accepted the invitation, and each has selected one director from every state of the union, for the approval of the secretary of the navy. The five directors in each state will constitute a committee of state directors for industrial preparedness. These state directors will report to the naval consulting board through the committee of which Mr. Coffin is chairman. Their immediate work will be to obtain an accurate inventory of all the facts necessary to be known to the army and navy of the resources of our nation, in order to supply munitions of war in case of need. To obtain this census they will be assisted by the members of each

Preparedness and the Engineer

THE engineer is active nowadays in army and navy affairs, as witnessed by the appointment of the naval consulting board, the nomination of representatives for the industrial census, the movement for an engineer reserve corps and the notable lectures on military engineering which are being given to the engineers of New York and vicinity.

In recognition of this trend in the engineering profession, the author raises the question for discussion of how the engineer may best serve his country, as a result of the call by the government for co-operation in organizing for preparedness, a movement which is largely dependent on engineering.

The first step in this direction was the invitation from Secretary of the Navy Daniels, to The American Society of Mechanical Engineers and ten other organizations, to form a naval consulting board to be headed by Thomas A. Edison. This board resolved itself into committees, one of which, the committee on production, has as its chairman Howard E. Coffin, who formulated a plan for organizing the industries for preparedness. This led the President of the United States to invite this Society and four others to nominate a representative in each state to assist the naval consulting board in "collecting data for use in organizing the manufacturing resources of the country for the public service in the case of emergency." Its immediate work will be to make an inventory of the facts necessary to be known to the army and navy relating to the resources of the nation for the supply of munitions of war in case of need.

The author shows that with the facts of this census properly collated we shall learn where we are weak and where strong. Not only will it be known where munitions, which include supplies of all kinds, can be obtained, but how rapidly they can be produced; to what extent America is independent of foreign countries for raw materials and manufactured products; for what kinds of munitions we have ample manufacturing facilities, and wherein we must provide means for making up the deficiency. These and other questions are suggested by the author and it is hoped that the discussion of other aspects of the situation will have a helpful bearing on the problem of how the engineer may best serve his country. Among the topics which suggest themselves are the following:

How can engineers consolidate their efforts in a way to oversee effectively the manufacture of munitions?

Should there be modification of standards for arms and ammunition to facilitate their manufacture?

What part should tools, gages, jigs and machine tools play in industrial preparedness?

What part should the textile schools take in the training of men for responsible positions in munitions manufacture, and in the testing of materials?

What should be done in the way of storing materials—nitrate and tungsten, for example—against a time of need?

A paper read at the spring meeting of the American Society of Mechanical Engineers, New Orleans, April 11, 1916.

of the five representative societies residing within the state. In many states there are more members than industries in which the army and navy may be interested. This indicates that this census will be rapidly completed.

The importance of such a census can scarcely be overstated. It has been estimated that for every million of soldiers and sailors at the front at least three million of workers will be needed to maintain them efficiently with the necessary implements and supplies of warfare. Major General Leonard Wood, U. S. A., estimates that a serious war would require at least 2,000,000 men. Under such circumstances 6,000,000 men would be required for producing munitions of war.

Industrial Inventory

An elaborate printed form has been prepared for taking the industrial inventory. It will be "a strictly confidential, non-partisan, non-political and wholly patriotic inventory of our country's manufacturing and producing resources. The information given upon this form will be used by the naval consulting board in aiding in effecting an industrial organization necessary to the plans for national defense. The information contained in these blanks is not to be used in any way to affect the business of the concern reporting, or for comparison with any other report of any kind previously filed by it. The value of this patriotic work can best be insured by making this report complete in every detail. We must deal with the problems of an adequate national defense as we deal with the problems of our everyday business life. We must face facts—not theories. We must do now, in time of peace, quietly, efficiently and thoroughly, those things which all know must be done to achieve true industrial preparedness, and which if postponed until an outbreak of hostilities must result in tremendous losses in lives and money."

The industrial inventory form, properly filled out, will give the names, post office address, age and nationality of the officers and directors; the capitalization, commercial rating and bank connection; a description of the plant, its possibilities for expansion, and its equipment for fire protection; telephone and telegraph facilities of the plant; source of raw materials, character of products, with volume, tonnage and value per year, and proportion shipped abroad. The form will also give information as to the capacity of the plant for producing munitions, the character of labor, number and nationality of employes, and the transportation facilities by rail and water.

Under the heading "agreements" appears the following:

AGREEMENTS

Will bid upon U. S. Army and Navy contracts in time of peace .....
Will accept U. S. Army and Navy contracts in time of war.....
Will accept minimum annual order (See Clause *A*) .....

Clause A—Minimum order for annual production will be accepted with the understanding that such order will be restricted to that product for which the manufacturer's equipment is best fitted. Also, that such order shall be for only such small quantity of product as will insure familiarity with the work upon the part of the manufacturer's organization. The manufacturer agrees that this minimum annual order shall be put through the factory in regular course and in such manner that foremen and those holding positions of responsibiilty shall become familiar with the peculiarities incident to the manufacture of these goods. In time of war the manufacturer will be expected to concentrate upon this same product and it is essential, therefore, that his entire organization, including purchasing, manufacturing, inspection, shipping, engineering, cost keeping and administrative departments, be made familiar with the work. Minimum orders will not be of sufficient quantities to interfere with manufacturer's regular production.

Will accept payment in accordance with Clause *B* .....
Will construct jigs and tools in accordance with Clause *C* .....

Clause C—The manufacturer will agree to make and preserve one set of special jigs, tools, gages or fittings necessary for the production of these goods, and corrected drawings shall be kept on file in the engineering department of the plant covering such special jigs, tools, gages or fittings. In short, the engineering or designing department shall maintain at all times corrected drawings from which the shop may, upon short notice, construct the necessary equipment for quantity production.

Will enroll skilled labor in "Industrial Reserve" (see Clause *D*).

Clause D—In war as now waged the industrial force has become quite as important as the fighting army. Skilled mechanics in all lines of production work must be kept from enlistment in the regular army and must be retained in the factories, mills and mines for the production of munitions. It is essential, therefore, that the names of these skilled workmen be listed and that the men themselves be enrolled in the industrial reserve. Explanations and instructions as to the detail of such organization will be submitted at a later date. A button or other distinguishing mark will be supplied by the government in the event of war to skilled workmen enrolled in the industrial reserve, and such enrollment will be considered to carry with it honors equal to enrollment in the fighting army. A government card will be issued to each man enlisted.

Will agree to limit profits in time of war in accordance with governmental regulations (basis cost plus .....
Will insert clause in all civil contracts making them contingent upon governmental needs in time of war .....
Will agree to restore existing labor agreements at close of war .....
List any and all agreements now in force .....

This inventory will probably show that many shops, well equipped to manufacture ammunition, will not employ the skilled machinist to make the required tools, jigs, gages and templates. Possibly then it will transpire that the most efficient plan would be for a government factory to make standard gages, jigs and templates, and loan or sell them to certain shops for use in the manufacture of shells, rifles, etc. The work of industrial preparedness should serve to inspire our machine tool builders to perfect and improve their product and perhaps to standardize their machine tools to the end that those who must needs puchase them would find an adequate and immediate supply available in case of emergency.

The various engineering societies contain in their membership men who could prepare most valuable papers on the subject of ammunition manufacture. For the present there may be many secret processes which for the time being may not be forthcoming in the way of books and papers, which, however, might be prepared in advance and held until the hour of need when through patriotic motives they could naturally be published for the benefit of the nation at large. The old saying that "necessity is the mother of invention" is now applicable to the nations at war, and it is reasonable to assume that they have discovered superior methods, processes and tools for the rapid and economical manufacture of shells, etc. The best method of overtaking such a lead would be by a combination of talent and experience such as might be brought about by a congress of ammunition manufacturers, assembled for the purpose of exchanging experiences, etc.

Wholly aside from the needs of war, there is a growing demand for liquid fuels for automobile and aeroplane motors. An interesting and profitable inquiry might be directed towards securing other fuels than gasoline, such as grain alcohol from saw-dust and other wood wastes, sugar house waste and corn-stalks.

An Example of Better Citizenship

Such an army of engineer census takers actively at work, cannot fail to breed a better spirit of citizenship. Working without compensation, they will set an example of patriotism which is bound to be felt. This spirit of patriotism will be transmitted to the working man producing war supplies. These workers are surely a part of the defensive force of the country and should receive adequate recognition as such.

Ex-Senator Elihu Root recently said, "Eternal vigilance is the price of liberty. The principles of American liberty today stand in need of a renewed devotion on the part of the American people." * * * "I want to see in my country the spirit that beat in the breasts of the men at Concord bridge—who were just and God-fearing people, but who were ready to fight for their liberty, and if the hundred million people of America have the spirit and it is made manifest, they won't have to fight."

How to Secure Safety in the Shop

THE PROBLEMS of safety engineering include the prevention of sudden injury to the employe's body, the elimination of gradual disability from slow-working physiological causes and the betterment of working conditions. The author points the way to the attainment of ideal industrial safety for employes

BY FREDERICK REMSEN HUTTON

SAFETY may be defined as the condition of being protected from assault or untoward circumstance. Industrial safety, with which this discussion concerns itself, is such a condition of protection in the surroundings of the wage-earner and in the purview of the factory and the shop of productive industry.

Safety is a broader concept than immunity, for the latter means a protection from a harm when a specific attack is made: while safety is the fact of protection both when the attack is made and at all other times and from all other forms of assault. Immunity from typhoid does not mean safety from railway accident, or even from tuberculosis of pneumonia.

There will be two kinds of safety. The attack will be upon the body of the worker, upon its softer tissues or its stronger bony structure; or it will be on the effectiveness of its physiological functions. In the first case, there is an impact of a mechanical force too great for the resisting power of flesh and bone to withstand, and under it the member or the body is crushed or mangled, and the body is maimed. In the other case, the physiological processes of repair or replacement of wastes in the body are disarranged by some slow (or rapid) invasion of poisonous matter absorbed in respiration; or through the skin, or in the food. There will therefore be a *dynamic* safety, and a *physiological* safety. This latter may be called industrial hygiene, or sanitation, and is rather in the scope of the medical man and technological expert. The dynamical field is that of the mechanical engineer and will be the thesis of this paper.

How to Secure Safety

A moment's analysis will show that in securing safety in the shop and factory against mechanical injury from the forces at work, there are two directions along which safety may be sought. An illustration will make this more obvious. A highway, for example, may be made "safe" by eliminating the bandit and the highwayman who have infested it; or, it may be made safe by providing adequate escorts and organizing caravans which shall be strong enough to repel attacks. So in industry, safety may be sought and secured by the design of the machine, whereby danger shall not lurk for the operator; or safeguards or safety devices may be applied to it, which shall make it difficult for the tissues of the body or the clothes of the operator to become entangled in the moving masses. It should be said at once that it is much better engineering to avoid raising a question or meeting a problem, than to create ingenious and costly solutions to questions or problems which have been made necessary because the engineer was not shrewd enough to avoid them altogether. In other words, basal design which raises no dangers is better than prevention of accidents by safety appliances at points of danger.

What Safety Means

Why spend money and effort to secure safety in the industries? The answer is threefold. In the first ism, the able and trained engineer has a duty to prevent the physical pain and suffering of the victim of an industrial accident. There is a real sense in which he cannot avoid being his brother's keeper. In the second place, there is the burden of bereavement and sorrow and of mental agony and spiritual distress and disappointment to be borne by the family and dependents of the man injured. These are burdens which no insurance or money compensation can pretend to reach or to remove: the most that these can do is to lighten. But the third consideration is the economic loss from an industrial accident. The nations of Europe, and Germany in particular, saw this before we in America woke up to it. The broad principle of economic working of a tool or machine is that it should be continuously at work, earning by its product the interest on its cost, and helping to pay overhead charges. Any cessation of productivity, or tool-idleness, is an invasion of economy. But an accident retards or stops productivity: first, by the disablement of the skilled operator himself; second, by the nervous shock to all who witnessed the accident and who ran to help; third, by the deranged productivity in the whole department where it happened; fourth, the loss of time to train a new operator to the skill and speed of the old one; fifth, the loss from defective work in this last process. Then, the direct losses in the cost of compensation and insurance, and the indirect costs of the ambulance and hospital expenses, borne through the community as a whole, as well as premature pensions and losses of schooling for those who are forced into wage-earning, before their time, to take care of dependents. Hence, there can be no argument except on the one side.

Finally, a distinction should be made between making a machine safe, and making it "fool-proof". A fool-proof safety equipment would mean one in which the ignorant toddling child or the curious finger of the idiot could not find access to the zone of danger in operation. The best thinkers hold that a certain alertness of mind in the presence of possible danger is favorable to safety of body, as well as to rapid and economic production. For this reason, safety engineering should not be overdone. Moreover, safety designing must not antagonize speed of production, or invade the wage-earning capacity of the operator beyond the point at which his interests begin to suffer. When this point is reached, human nature being ambitious and self-seeking, the safety apparatus will be unpopular, and presently cast aside.

Problems of Safety Engineering

A distinction which must be made in any discussion of safety will again limit the field of treatment in this paper, between the types of safety attainable within confined spaces and with stationary tools, and that to be planned for in the open air industries, such as railway, the quarry, the building plant, the mine and the navigable body of water.

Recapitulating within these limits set, a broad survey of safety engineering reveals four great divisions of the subject:

First.—Accidents and safety apparatus to prevent them, originating from the

Presented at the meeting of the International Engineering Congress, San Francisco. The author, Frederick Remsen Hutton, is past-president, American Society of Mechanical Engineers and vice president, American Museum of Safety.

sudden injury to the body from the various types of moving forces in industry.

Second.—Gradual disability and loss of wage-earning capacity from slow-working physiological causes, resulting in occupational disease.

Third.—General. Combinations of the above two.

Fourth.—Betterment. Methods for increasing the wage-earning capacity of the human unit, by improving his physical condition and mental surroundings.

The foregoing analysis has made almost unavoidable the philosophy and sequence of the detailed discussion next in order. It should begin with the prime mover as a source of possible destructive energy; follow through the methods of transmitting that power, by shafting, gears, belts, piping and wire; discuss the dangers met in internal transportation by elevator, shop railway and crane; and finally treat of the dangers at the working zone of the tools or machines. If the treatment were to be at all complete, the tools or machines would be those of the wood-working shop, the machine shop, the foundry, the chemical establishment, and the miscellaneous productive or manufacturing installation. Accidents are also due to exposing the body to the action of gravitation and injuries from its fall or the fall of heavy masses on it. There are also the problems of collective safety, where numbers are in one place, and the dangers from fire and smoke and panic are to be guarded against. It will therefore be plain that to keep treatment within the practical limits set by wisdom and the proprieties of the case, some of the topics glanced at above must be arbitrarily passed by, and attention directed to a selected remainder—and that the discussion offered cannot be exhaustive in any case.

Safeguarding Source of Power

To assume the general case, consider a horizontal corliss engine. It will have dangers from the valve gear, the cross-head, the crank and connecting rod, the flywheel and the revolving shaft. An arm or a hand or clothes or a foot may be entangled, or a slip or a fall may bring a burnable tissue against hot metal. Safety is, therefore, to be secured by surrounding the whole danger zone by a "keep out" fence. An acceptable type has pipe rails with a bank-lattice netting in combination. The path of the governor balls also is isolated. The bank lattice serves to prevent a slip into the wheel pit, and to keep any rolling object from falling against the wheel or its spokes. Panels of bank lattice may be used instead of the pipe posts and rails, and the toe-guard may be of wood. Alternative safety guards for the reciprocating parts include a sheet-steel covering which envelopes the crank and is led back almost to the cylinder. This has a latticed opening in front of the crank for inspection and for coolness. Sliding panels give access to the ends of the connecting rod, so that the operator may feel the metal from time to time to detect overheating. With large engines the main bearings can be made the safe means of crossing the shaft. The steps and railings make the oiling of these critical points far less dangerous. Toe-guards should be used on the gallery face to prevent any one slipping through and also to prevent objects rolling down onto the moving parts below.

If the source of danger is an electric motor for a section of the plant, it can be made both safe and foolproof by a lattice cage which can be opened only by unlocking the panel. The belt also is made harmless by a cage in which the belt can be lead at any angle. The operating switch should be outside the cage in all cases.

Complete safety at the origin of power and motion calls for engine safety stops. These are of two diverse kinds, and they may be used together or independent of each other. One kind is to prevent a racing of the engine in case of some disarrangement or failure of the governing apparatus, or a release of the normal load, so that it tends to speed up to a dangerous rate. A racing engine may rupture its flywheel; or if connected mechanically to operative machines, the overspeeding may do great harm all through the plant. Such anti-racing stops are of many

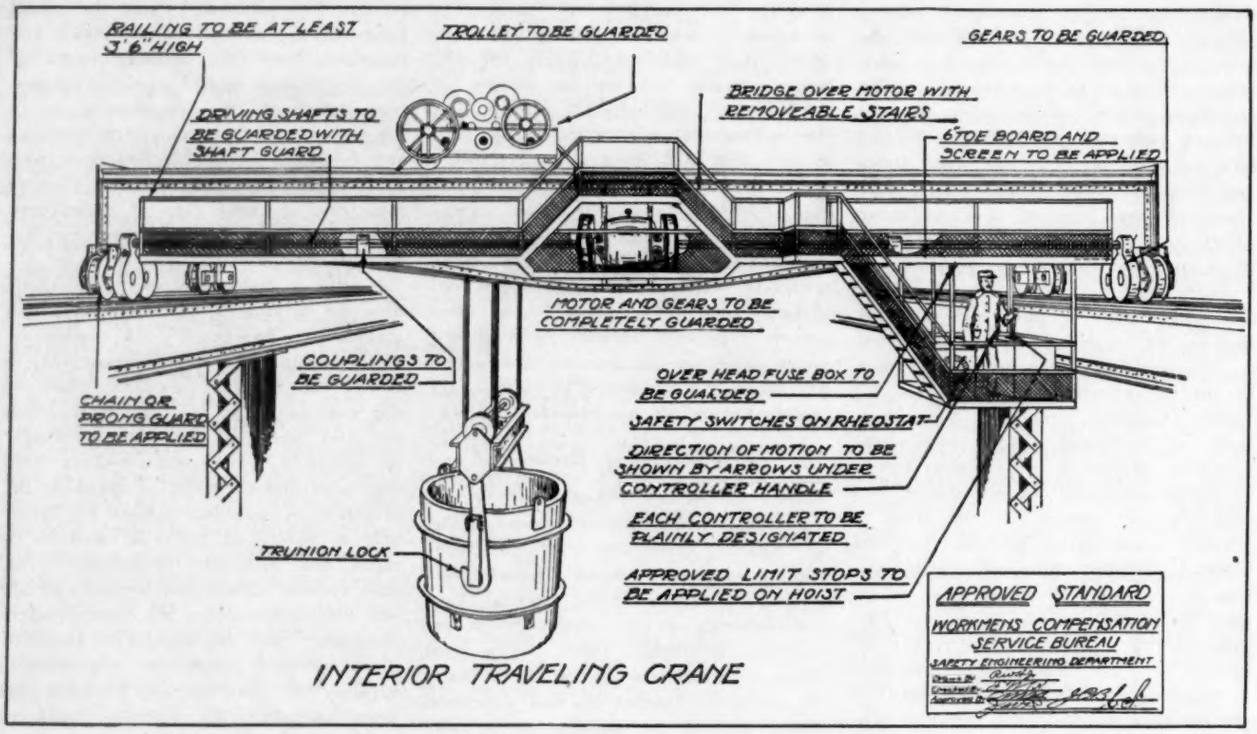

RAILING TO BE AT LEAST 3'6" HIGH
TROLLEY TO BE GUARDED
GEARS TO BE GUARDED
BRIDGE OVER MOTOR WITH REMOVEABLE STAIRS
DRIVING SHAFTS TO BE GUARDED WITH SHAFT GUARD
6" TOE BOARD AND SCREEN TO BE APPLIED
MOTOR AND GEARS TO BE COMPLETELY GUARDED
COUPLINGS TO BE GUARDED
CHAIN OR PRONG GUARD TO BE APPLIED
OVER HEAD FUSE BOX TO BE GUARDED
SAFETY SWITCHES ON RHEOSTAT
DIRECTION OF MOTION TO BE SHOWN BY ARROWS UNDER CONTROLLER HANDLE
EACH CONTROLLER TO BE PLAINLY DESIGNATED
TRUNION LOCK
APPROVED LIMIT STOPS TO BE APPLIED ON HOIST
APPROVED STANDARD
WORKMEN'S COMPENSATION SERVICE BUREAU
SAFETY ENGINEERING DEPARTMENT
INTERIOR TRAVELING CRANE

FIG. 1—SAFETY GUARDS ON FOUNDRY CRANES

types, but, in the main, they depend on having a weight, of sufficient magnitude to shut the throttle when released, and which normally shall be held up and released only to shut the valve in case of need. The detent, which holds the weight from falling, may be released electrically from distant points, or it may be connected mechanically and directly to the governing mechanism, and be released when the latter fails to act, or it may be released by hand in emergency. The other type shuts down the main engine directly from a distant point, in case of accident or emergency, and does this quicker than it could be done by any signal to the engine room. The most reliable stops operate on a closed circuit, so that opening the circuit at any push-button in any department releases the detent.

Transmission of power and motion from the prime mover to the machinery and tools or processes, will be by shafting and belting, with some gears; or, by pipe or wire. With the shaft and belt system, a lattice-panel safety is the most serviceable where the belt comes up through the floor. It should have a height sufficient to eliminate the risk of a woman's hair being entrained in the windage or the electric zone of the moving belt. When the belts lie somewhat horizontally and overhead, a guard netting under the lower bight should safeguard against an injury if the belt breaks, and will keep hair from being entangled.

Shafting, usually, is overhead, to keep belts out of the way and to leave the floor free for tools and transportation. Its dangers are to the oiler who mounts, by a ladder, to the shaft level and may have an arm or clothes caught in the revolving units, and the dangers to those below, should the shaft be dragged down. The oiler's danger can be minimized by a mesh screen, and by suppressing projecting set screws on pulley hubs and projecting bolt-heads on flange couplings. The use of so-called "hollow" set-screws and the recessing of the flange faces to take the bolt heads and nuts are means to avoid these troubles. Some designers have covered the entire shaft with a hollow sleeve, which turns with the shaft when it meets no resistance. A man's arm or body against the lose sleeve will arrest its motion, while the shaft revolves harmlessly underneath.

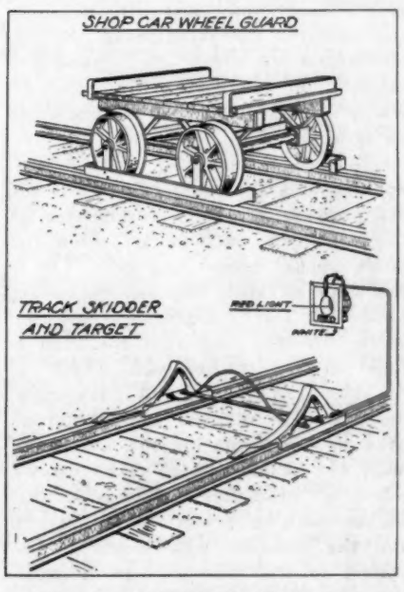


FIG. 2 — SAFETY DEVICES FOR INDUSTRIAL RAILWAYS

For the run of the main line of shafting, with countershafts connected to it, the pulleys should not be so near the hanger or bearing that a strong, new belt running off the pulley would jam in the space between hub and bearing and pull down the shaft by breaking or stripping the holding bolts. The clearance space at the side of the pulleys should be greater than the widest belt or pulley face.

Dangers of Chain Drives

Chain drives, operated by sprocket-wheels, should be protected. Clothing caught where the chain and wheel come together can only be released by tearing. Both the sprockets and the chains should be lattice-guarded. Toothed gears in mesh, in transmission of power and motion, are a source of accident to the hand and fingers. The danger zone is those parts of the tooth circumference of both wheels which are approaching their point of contact, and the crushing of the hand or fingers between the teeth means amputation or loss of use. The faces which approach one another and the sides or bases of the cylinders or cones should be guarded, either with sheet steel or lattice. The lattice is cleaner, allows lubrication through the mesh and permits air circulation. The guards should be removable, for access to clean the gears, but not so easily put out of place as to defeat their purpose.

Power is transmitted also by electric wiring and by piping carrying pressure. The main leads should have line switches, for safety, dividing the plant into sections, as has been urged for the shaft system by the use of clutches. By opening such switches, the sections below them are cut off and become dead. Such a switch should be capable of being padlocked open, so that a worker below it would be in no danger of having current turned on until he is ready.

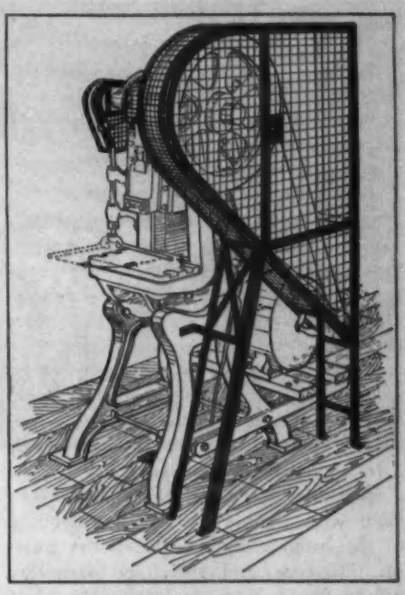


FIG. 3—GUARD FOR STAMPING PRESS

The traveling crane has been in use for 50 years as a means for picking up heavy masses at one point and depositing them in another. It assembles big engines and puts heavy work on planer bed or lathe. There are five classes of danger to which it leads. The first is to its own structure, from over-running its track and from derailment. This is met by safety stops on its rails, and by so designing these stops that the current driving the crane is cut off when the crane hits the stops. The second is from over-hoisting; this is met in the same way as in the over-running, by making the excessive lift cut off the actuating current. The third is the danger to men below from the falling of any parts of the crane structure, such as keys or bolts. This is met by having a mesh or lattice netting under the entire structure to catch such missiles. The fourth is the accident from a fall of the load from its slings by slipping, or by a failure of the hoisting cable or chain or hook. The fifth is the risk to the overhead operator in going to his place. Ceaseless care and unremitting inspection and skill in slinging reduce the fourth risk; and the construction of railed gangways should prevent the last. It should be a shop rule never to walk or stop under a load suspended from a crane; and blocking should always be laid under a piece of work so suspended when a man is to work where he would be crushed if something gave way or the tackle overhauled.

When transportation from shop to shop is by buggies or cars on a railway on the floors, the time transit

from car to crane is one of danger. If the lift of the crane is not vertical but has a direction in which the car is free to roll, the feet of the men around the car are in great jeopardy. A toe-board, such as is shown in Fig. 2, is quite worth while.

The elevator, as a means of internal transport, is a railway, with a car running on a track, although a vertical one, and is also a source of danger. It appears in two general classes for freight purposes: In one, the car moves in a well or in a tower reserved for it; in the other, it moves through hatchways, or openings in the floors, which are not isolated, but are located where convenient.

In general, the dangers arise from a possible fall of the platform or cage with people on it; the catching of the human body between the moving platform and the fixed structure of the floors; and the fall of the body into or down through the open hatchway. The danger is greater with a hatchway in an open floor than with the elevator in a well; since a man can approach the opening from all sides in the former case, and only from the front in the latter; but the principle of safeguarding will be the same in both cases. Skilled insurance inspection of cables and the progressive grip on the guides of modern elevator "safeties" and the use of the plunger type of elevator will diminish the cage or platform accident, and improved gating must be looked to for the reduction of hatchway dangers. With elevator wells, the principle of interlocking the gate with the starting mechanism can be applied so that the car cannot be started from any floor until the gate is closed; and the gate cannot be opened unless the platform is at the floor level and closes the well opening. Such interlocking also can prevent a man from being caught between the fixed floor and the moving platform, because the gate must be completely shut before the car is started from the floor level, and the car must be at rest at such level, before the gate can be opened. This interlocking can best be secured mechanically, rather than to depend on electric devices. There are several effective designs for this purpose. Adequate lighting at the hatchways and wells will also greatly lessen all types of accident at these points.

Safeguarding Individual Tools

The safeguarding of individual tools is as wide and as diversified as the field of industry, and that of the skilled activity of the operative of power-driven tools and machines. For brevity, only four typical sources of danger and the remedies, will be examined, leaving it to skilled ingenuity to apply basal principles to the manifold varieties of the problem and their needs.

Wood-Working Tools

The high speed of the cutting-edge of wood-working tools leads to their danger. The teeth of the circular saw, for example, disappear in a halo around its visible disk, and yet the danger is in the halo ring. Band-saws moving at a high rate of speed are flexed over their carrying wheels, and are twisted, in sawing curves, where the blade enters the wood. They are liable to part under stress, and the freed ends to cut the operator in face or head. Circular saws may also convert the cut strip into a javelin as it is released or splits at the end of ripping cut, and hurl the weapon against anyone in its path of flight at high velocity. Band-saw safety is best secured by boxing the carrying wheels; and safety for circular saws by hooding them, leaving exposed only the small sector at which the work is to be done. Circular-saw hoods must usually be supported and adjusted from above the table, so as to leave the latter free in all directions, to receive stock lengthwise, crosswise and at angles.

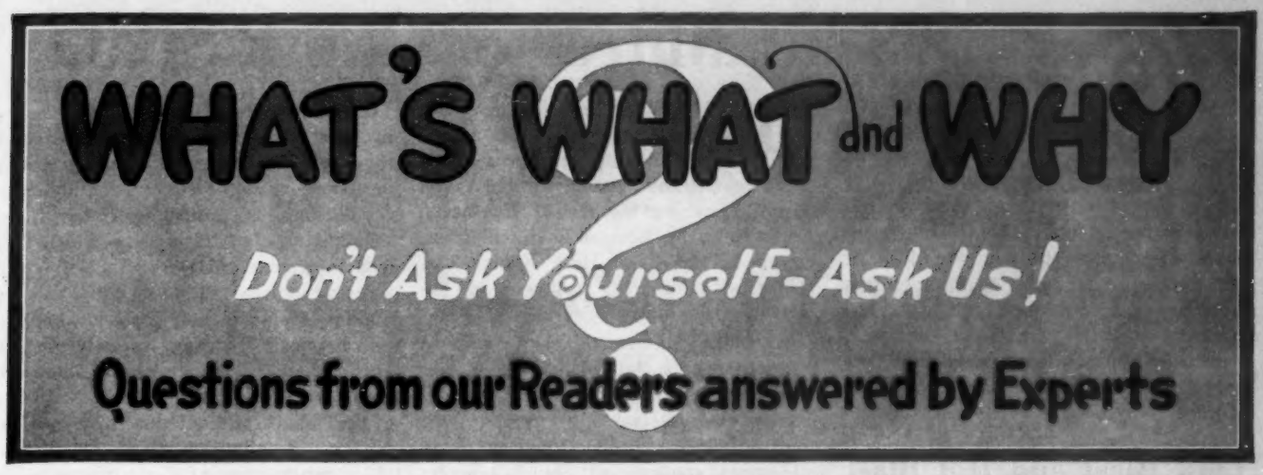
The lathe is taken as a type of the metal-working tool driven by power with whose mechanism the operator has to come in close intimacy in his work of control and operation. His fingers are in danger from the gears by which the belt or motor speed is reduced and power secured by its transformation. His clothing is liable to be caught in dogs and drivers as the work revolves and he leans over it to measure and inspect. The obvious safeguards are mesh-hoods over the headstock, which shall encompass the gears, and shields over the face-plate. The turret-lathe, by eliminating the occasion for calipering the work, and by putting the permanently adjusted tool in place of one that has to be set frequently, has brought in safety with its increased production.

The emery-wheel as a grinding or sharpening machine and as a machine to produce accurate surfaces is really in two classes. It is as a grinding machine that its danger is most insistent, since the operator will be in or near the plane in which the somewhat fragile disk is revolving, and in which it will throw its pieces in case of fracture in use. It is in grinding, as sharpening, that pressure is brought against the disk in directions in which it is not most resistant. The emery wheel also may be dangerous to the health of the operator, by reason of the particles of the abrasive of which the wheel is made and the metallic particles ground from the work-piece. Hooding the wheel with a material strong enough to keep in the missile pieces of a broken wheel, except only at the working sector of its circumference, is one way to lessen accident. Another way is to grip the wheel disk between flanges which are not parallel to each other, as respects the faces which hold the wheel, but are so shaped that the faces are farther apart at the shaft than at their outer edges. If the wheel is also convex on its faces to fit these flanges, it is obvious that segments of the wheel, in case of a break, cannot get out of the grip of the flanges, because these are nearer together at their outer edges than at the central portions. Furthermore, by means of an exhaust-fan system particles of dust may be kept away from the operative.

The dangers in the foundry, and the safeguards necessary, will be considered briefly. The risks are from the poisonous gases on the charging floor; from the hoisting apparatus leading to the charging floor; from falls from such upper level; from the molten metal in its ladles and the latter hung by chains or upsetting from a failure of the tilting mechanisms; from the chipping and power-cleaning of the castings by emery-wheel or tumbling-barrel; from failure or derailment in the overhead trolley system, if such is used for light ladles; and from sparks and globules of hot metal reaching the eyes. The guarded crane shown in Fig. 1 shows what is to be secured.

Conclusions

When the designer and creative engineer have done their utmost, there still remains the function of the administrator to create an atmosphere in the plant and among the employes, which shall make safety in operation an ideal of each individual. This object has been sought by many means, but probably the most effective is the organization of safety committees of the workmen, particularly, when the latter speak many languages. It is the duty of such committees to see to it that safety appliances are used when provided, and that the man is fully advised in his own speech as to safety to himself and his companions. The reckless and indifferent, by a pressure from his own associates, must not be allowed to take chances, when a mischance would cost the life or earning power of the careful and the innocent who would be involved in the disaster. In a word, the process is one of education, and then *more* education.



Foundry, Malleable and Forge Iron Output

According to recent statistics, foundry pig iron production in 1915 *shows an increase of less than* 1,500,000 *tons over that of* 1900, *notwithstanding the fact that the total output of pig iron increased from* 13,789,242 *tons in* 1900 *to* 29,916,213 *tons in* 1915. *On the other hand, malleable pig iron production increased from* 173,413 *tons to* 829,921 *tons and the output of forge iron declined from* 793,092 *to* 316,214 *tons. If possible, we would like to have you advise us the cause for the slight increase in foundry iron manufacture, the big increase in malleable iron production and the decline in forge iron output.*

In a measure, the figures for the foundry pig iron production are misleading when taken as a guide to the growth of the foundry industry of the United States. During the last 15 years the steel foundry trade has grown tremendously and a large tonnage of basic and low phosphorus iron is used by the steel casting plants, this total not being included in the statistics of foundry iron production. These figures represent only the pig iron consumed in the manufacture of gray iron castings and do not take into account the large tonnage of pig iron used by the crucible, open hearth and converter steel foundries. In a measure, the malleable iron figures also are misleading, since it is apparent that probably from 1900 to 1904, so-called off-bessemer iron was included in the bessemer iron figures and was not credited to the malleable iron tonnage consumed. However, the malleable iron output in the United States has had a large growth in the last 10 years and from the statistics which you quote it is apparent that the steel foundry industry has drawn more largely from the gray iron foundries than from the malleable shops. The decline in the consumption of forge iron is attributed directly to the passing of the puddling furnace. However, it is believed by wrought iron manufacturers that the low point was reached last year and that there will be a gradual increase in output owing to the demand for wrought iron products which have not been replaced by steel.

Pig Iron Stocks

Can you give us some information as to merchant stocks of pig iron in eastern Pennsylvania and Virginia?

The merchant stocks in eastern Pennsylvania at present are around 90,000 tons, and those in Virginia, somewhat less than 150,000 tons. Considering the number of furnaces blowing, the eastern Pennsylvania stocks are about as low as they normally could be expected to be. In Virginia, there has been a steady decline in stocks in recent months, until the recent freight embargoes were declared. Recently stocks have been showing some increase.

Spanish Manganese Ore

Since the outbreak of the war practically no Spanish manganese ore shipments of importance have been received at American ports, notwithstanding the fact that Spain is one of the neutral nations. It seems to us that if this Spanish ore could be obtained, the present scarcity of ferro-manganese could be relieved to some extent.

In 1907 Spain exported 67,996 tons of manganese ore, but since that year its exports have steadily declined and in 1914 they aggregated only 8,965 tons and last year 9,136 tons. On the other hand, the pig iron exports of Spain in 1915 showed a tremendous increase, as compared with the previous year, having totaled 75,649 tons, as against 28,735 tons in 1914. It is possible that the manganese ore is being converted into ferro-manganese in Spanish stacks and the product is being exported and is included in the statistics of pig iron exports for 1915.

Checks on Ground Cam Shafts

We have experienced considerable difficulty due to checks appearing on the carbonized and hardened cheeks of cams on integral cam shafts during the process of grinding. Will you kindly give us any suggestion that might overcome this irregularity?

The nature of your trouble is so complicated that it would be difficult to offer suggestions at long range which would be sufficiently compresensive to permit you to arrive at the root of the matter. In order to clear up your difficulties, we would suggest a thorough investigation of your heat-treating methods, together with a study of the composition of the steel used, and the conditions under which the work is ground, including the speed of wheel, speed of work, grade of wheel, and lubricant used. The amount of stock removed, the amount of feed per revolution, and the condition of the face of the wheel also should be considered. In a case somewhat similar to yours, it was discovered that the operator was trying to force the work too much, taking too deep a cut. The remedy, of course, is obvious—lighter cuts and quick passes. Under these conditions, of course large production is not possible. Production, however, always is limited by the degree of refinement required.

Foundations for Grinding Machines

Can you advise us whether or not it pays to install concrete foundations under grinding machines?

Tests conducted by the Norton Co., Worcester, Mass., show that under certain, specific, identical conditions as to character of work handled, etc., the average life of two wheels on a wood floor was 113 days per wheel whereas the average life of two similar wheels

on a concrete floor was 188 days per wheel. The total increase in life per wheel due to solid foundations was therefore 75 days. Since the wheels cost $19, the average cost per wheel per month on the wood floor was $5, the cost of the concrete floor being $3. The saving per wheel per year, therefore, on the concrete floor was $24. This seemingly large difference in the life of the wheels is due partly to the vibration of the wood foundation and partly to the fact that the wheels on this floor had to be run at a lower speed than best suited to the conditions surrounding the work.

Cold Blast and Hot Blast Charcoal Iron

What is the difference between cold blast and hot blast charcoal iron? Has the production of cold blast charcoal iron increased in recent years and what is the approximate output of these two grades?

Practically all of the small charcoal furnaces which were scattered over the eastern half of the United States prior to the extensive utilization of coke as fuel in the reduction of iron ore, were driven with a cold blast, the air not having been preheated before it entered the stack. Many of these furnaces, of course, have passed out of existence, although a few of them still remain, notably in the south and in southern Ohio. Hot blast charcoal iron is made by the use of preheated air, the operation being similar to that of driving a coke-fired blast furnace. During the past five years the production of cold blast iron has declined over 50 per cent. In 1911 the output was 10,930 tons, as compared with 5,302 tons in 1915. On the other hand, the production of hot blast charcoal iron in 1911 was 267,746 tons, as against 290,850 tons in 1915. In 1912 the production of hot blast charcoal iron was 338,161 tons. The foregoing indicates the passing of the cold blast charcoal iron process and the increase in the output of charcoal iron made by the hot or warm blast.

As to Capitalization

Should the word "babbitt," when used in referring to babbitt metal, be capitalized?

Capitalization is a matter about which opinions vary greatly. In our opinion, there is no more reason for capitalizing babbitt metal than there is for capitalizing the word "boycott." The rule of the Penton Publishing Co. is not to capitalize bessemer pig iron, corliss engine, or the name of any product, process or machine named in honor of a man who is dead.

Failures of Crank Shafts

DISASTROUS experiences with large center-crank shafts is the subject of a paper presented at the New Orleans meeting of the American Society of Mechanical Engineers, April 11-15, by Louis Illmer, chief engineer of the Lake Heat Engine Co., Milford, Conn. The following is an abstract from the paper:

Investigations as to the cause of repeated shaft failures revealed inherent structural weakness. The reinforcements undertaken to remedy this condition were based upon a careful stress analysis of actual sag determinations conducted upon the wheel shaft.

The shafts in question were mounted in three-point bearing supports and carried a heavy flywheel between the intermediate and outboard bearings. This mode of support sets up a pernicious interaction of bearing load, which culminates in excessive wear in the intermediate bearing.

When the wheel shaft lacks adequate stiffness, the appreciable lift of the free end of the web portion of the shaft exerts a pressure against the cap of the outer main bearing, which in turn causes the intermediate journal to become overloaded. The drop resulting from rapid wear reduces the upward thrust against the outer main bearing cap and this finally relieves the intermediate bearing of overload. Still further wear causes a portion of the downward shaft load to be transferred from the intermediate bearing to the outer main bearing.

It was found that when this readjustment is complete, the load upon the two main bearings becomes approximately equalized. The attainment of this state of equilibrium as to wear, involves putting an excess stress upon the shaft fibers, which is likely to lead to ultimate breakdown of the wheel shaft.

The observed wear in the intermediate bearings was found to exceed ⅛-inch in less than 30 days of operation when starting with newly aligned bearings, but after the intermediate bearing had dropped sufficiently to equalize the load upon the two main bearings, the wear became more nearly normal.

Stress curves corresponding to the actual shaft deflection curves show the critical surface fibers to be subjected to a reversing stress ranging from 16,000 pounds per square inch compression to more than 29,000 pounds per square inch tension stress. The life of these shafts, as expressed in observed running time required for breakdown service, appears to be in accord with the expected number of revolutions as determined by Stromeyer's law of fatigue.

Reinforcements were necessary to strengthen the shaft design, and in making replacements, both carbon and nickel steel forgings were tried out, but the nickel steel shafts did not come up to expectations. The results of tests bars taken from some critical sections of the defective nickel steel shaft when compared with somewhat similar tests made upon a carbon steel shaft, point to elongation as being the vital factor in shaft specifications.

When carrying a heavy wheel, the web dimensions should be made heavier than usual so as to allow for the increased span between the wheel supports, which invariably results from excess wear in the intermediate main bearing. In order to keep the wheel shaft stress within desired limits under load conditions found in these engines, it became necessary finally to enlarge the intermediate journal to 3/2 of its original diameter, thus making its dimensions fully as large as would be required for side crank construction.

The conclusion arrived at is, that for large stationary gas or oil engines, it is advisable to use the side crank construction rather than a center-crank shaft, since the former type eliminates the troubles encountered when carrying a heavily loaded wheel shaft upon a three-point bearing support. The importance of making careful analysis of the underlying stress conditions, before fixing upon the final dimensions for a center-crank shaft carrying heavy flywheels cannot be overestimated.

Recently an American syndicate opened a manganese mine at Madinga, on the Gulf of San Blas, in the province of Colon, Panama, about 70 miles east of the city of Colon. A trial shipment of some 900 tons of ore has recently been made to New York. One of the owners, who acts as agent for the syndicate, states that shipments of 1,500 tons a month can probably be made for several months if vessels are available for that purpose. A wharf at deep water has been built near the mine, and if the supply of ore holds out and can be profitably marketed, it is the purpose of the owners to develop the property to a considerable extent.

Fire Tests of Building Columns

Many millions of dollars are annually spent on the construction of buildings, the integrity of which, in the event of fire, is dependent on the behavior of the steel columns supporting the structures. Very little engineering data are available which would permit of any certain conclusions as to the thickness and kind of fireproof covering required to render these columns safe under various conditions of fire hazard. The requirements of city building codes on these questions are so different that it is evident that some codes are either requiring an unnecessarily thick fireproof covering, with undue increase in construction costs, or else other codes are requiring too thin coverings, with undue increase in danger to the stability of the structure under the existing fire hazards.

Fire tests on building columns are being carried out jointly with the Underwriters' Laboratories, Chicago; the Mutual Laboratories, Boston; and the federal bureau of standards. In the first series of tests are included over 70 structural steel, reinforced concrete, and cast iron columns. The columns will be tested in a specially design furnace. The columns to be tested are designed for a working load of 50 tons. Each column will be placed in the furnace, a constant follow-up load of 50 tons applied by a hydraulic machine, and the column heated until it fails. The temperature in the furnace and in various parts of the column will be measured by suitable thermocouples and the amount of deformation produced in the column during the test will be measured by means of a suitable apparatus which has been especially designed for this purpose. The steel columns are of various types commonly used in building construction, such as rolled H, plate and angle, plate and channel, latticed channel, etc. Some of the columns will be tested unprotected, some partially protected, and others fully protected.

Intra-Shop Transportation

BY NORMAN WHICHELLO

THE new south works of the J. I. Case Threshing Machine Co., at Racine, Wis., which produces cast iron parts for tractors and automobiles, presented to the designers an interesting and complex problem in intra-factory transportation. This problem has been solved by the installation of a carefully planned monorail system and several overhead traveling cranes, all furnished by the Shaw Electric Crane Co., of Muskegon, Mich., and also by the employment of a large number of small hand cranes with pneumatic hoists.

A virgin site of considerable area being available, the designers were not hampered by existing buildings or similar limitations. The plant is consequently one of exceptional harmony and efficiency, and comprises a foundry 174 x 755 feet, a machine shop of nearly the same dimensions and a 4-story storage building, besides a large power station and auxiliary buildings.

Fig. 2 is a plan view of the plant, showing the cranes and the monorail track, the latter reaching all departments and much of the yard. The track layout comprises 5,850 lineal feet of track and 25 track switches, and there are at present four double-hook monorail hoists or trolleys of six tons capacity each.

The track-switches are the fixed-tongue type in which there is no moving part, although the operator in the cage can select either route at will. The illustration, Fig. 1, shows the yard where pig iron, coke, sand and other foundry requisites are delivered in railroad cars on the tracks shown. From these cars the materials are unloaded by the overhead traveling crane and stored in large bins, into which the yard has been divided since the photograph was taken. Pig iron and coke are reclaimed by the same means and deposited on the cupola charging platform, which may be seen in the picture. In order to efficiently perform these several functions, the traveling crane has a wide-gage trolley with two entirely independent hoisting mechanisms, one operating a grab-bucket and the other a lifting magnet, both of which are

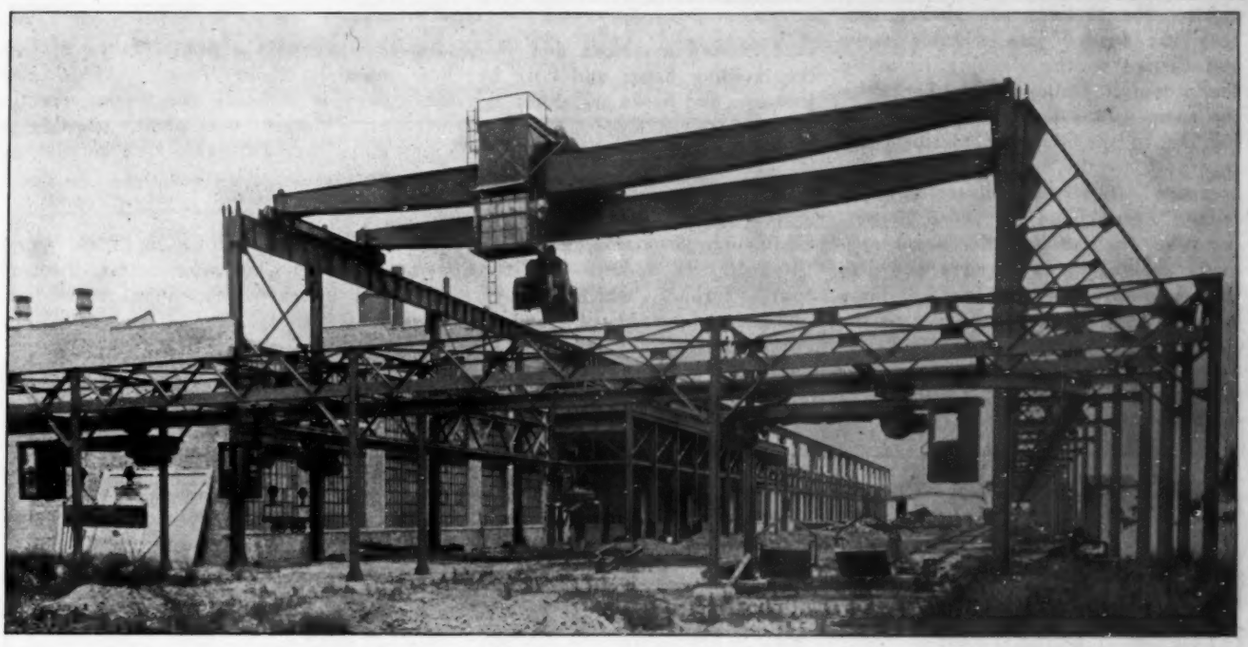
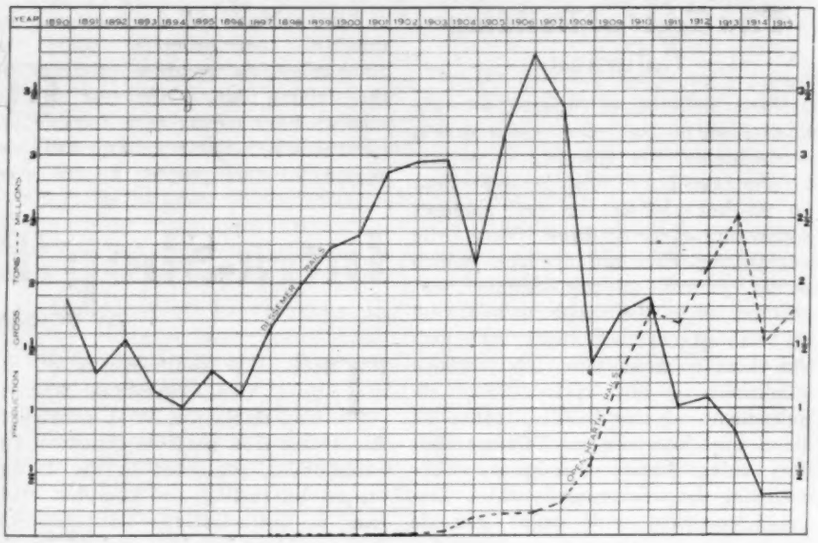


FIG. 1—MONORAIL SYSTEM AND CRANE EQUIPPED WITH MAGNET AND BUCKETS

permanently attached to their respective hoists. Emergency provision is also made for bringing pig and coke into the foundry by the monorail system and for raising it to the charging floor by means of elevators.

In the foundry, the metal is distributed from the cupolas in three and four-ton capacity bull ladles. The side aisles are equipped with small hand-travel cranes having air hoists, and the metal is poured from the monorail ladles to the smaller crane ladles and from these latter into the molds. Metal for the other molding floors is poured from the monorail ladles into smaller ladles suspended from trolleys running on an auxiliary track parallel to the monorail track. From these small ladles the metal is poured into hand ladles and thence into molds.

After the castings are shaken out, they are loaded into suitable trays and carried to the cleaning room by the monorail trolleys, and thence by the same means to the storage building, or to the shipping platform for transport to the main works of the company. The monorail trolleys distribute cores from the core department to the molding floors on specially designed core carriers and also deliver sand in one cubic yard dump buckets, from the sand storage to the sand mixing machines and thence to the molding floors and core benches. Patterns and flasks are similarly transported between the foundry and their respective storage places.



PRODUCTION OF BESSEMER AND OPEN HEARTH RAIL IN THE UNITED STATES

New Open Hearths.—The National Enameling & Stamping Co., Granite City, Ill., is adding a 62-ton open hearth furnace, which will give the plant five open hearths and the new equipment is expected to be in commission about June 1. This company is seriously considering erection of a large coke plant, possibly of more than 200 ovens, but details have not yet been worked out.

The Arrow Forge & Tool Works, 31 North Jefferson street, Chicago, has increased its capital stock from $10,000 to $15,000.

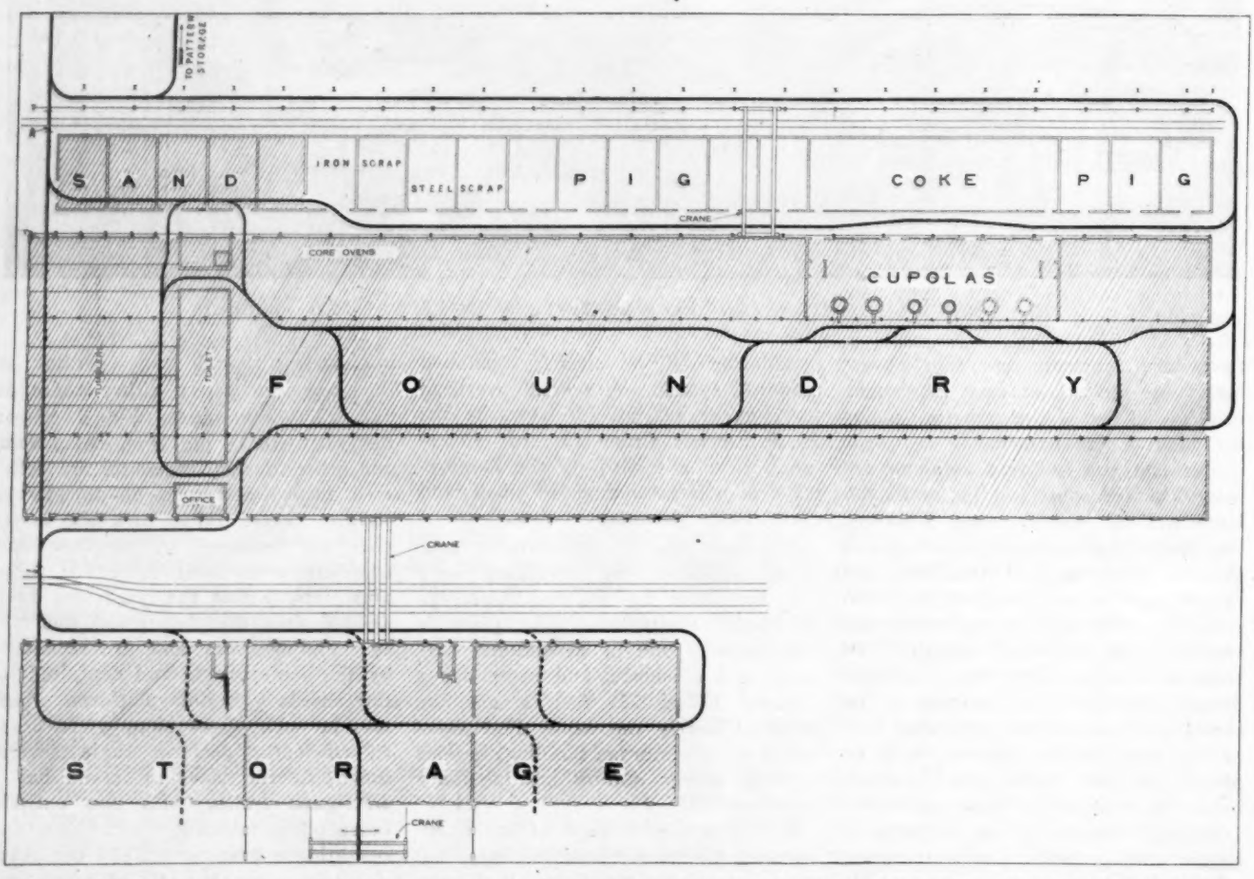


FIG. 2—PLAN OF J. I. CASE THRESHING MACHINE CO. PLANT SHOWING ARRANGEMENT OF CRANES AND MONORAIL

Engineers

Form Committee on Military Affairs—Course of Lectures

A group of prominent engineers and contractors of Chicago and vicinity have co-operated in forming a joint committee on military engineering. The founders are members of all of the leading engineering and contracting organizations of Chicago, including the local branches of the national engineering societies.

The purposes of the committee are to further military preparedness among engineers, contractors and their associates by the following means:

Courses of lectures.

Assigned reading.

Studies and practical instruction in military engineering.

Assisting engineers to qualify as officers in the national reserve corps of civilian engineers.

Urging enlistment in and support of engineer troops of the national guard and such other organizations as the government may create.

Furthering instruction in military engineering in training camps and the attendance in them of those qualified.

By such other means as from time to time may be deemed advisable.

The joint committee has already prepared a program covering the vital points outlined. To date the program is practically complete for a period extending from April 20 to July 25. Something of interest will be taken up each week, including lectures by Lieut.-Col. W. B. Judson, engineer corps, U. S. army; two lectures by Major P. S. Bond, engineer corps, U. S .army; Lieut.-Col. Mason M. Patrick, engineer corps, U. S. army, and several exhibition drills, terrain exercises and inspection trips under the direction and guidance of various officers of the engineer troops of the Illinois national guard. Additions to the program will be made from time to time.

Engineers, contractors and their associates in Chicago and vicinity are invited to join the joint committee on military engineering. Correspondence should be addressed to the secretary, Robt. F. Hall, 111 W. Washington street, Chicago.

The directors of the joint committee are: Wharton Clay, chairman; Robt. W. Hunt, vice chairman; Robt. F. Hall, secretary-treasurer; Bion J. Arnold, W. W. DeBerard, J. de N. Macomb Jr., H. S. Baker, Robert I. Randolph and Vernon C. Ward Jr.

Production of Rails in the United States, 1897-1915

(Compiled by the Statistical Bureau of the American Iron and Steel Institute.)

PRODUCTION OF RAILS BY PROCESSES, IN GROSS TONS, 1897–1915.

Years.	Open-hearth	Bessemer.	Rerolled.*	Electric.	Iron.	Total.
1897.....	500	1,644,520	Included with Bessemer and open-hearth steel rails from 1897 to 1910 inclusive.	.....	2,872	1,647,892
1898.....	1,220	1,976,702		.....	3,319	1,981,241
1899.....	523	2,270,585		.....	1,592	2,272,700
1900.....	1,333	2,383,654		.....	695	2,385,682
1901.....	2,093	2,870,816		.....	1,730	2,874,639
1902.....	6,029	2,935,392		.....	6,512	2,947,933
1903.....	45,054	2,946,756		.....	667	2,992,477
1904.....	145,883	2,137,957		.....	871	2,284,711
1905.....	183,264	3,192,347		.....	318	3,375,929
1906.....	186,413	3,791,459		.....	15	3,977,887
1907.....	252,704	3,380,025		.....	925	3,633,654
1908.....	571,791	1,349,153		.....	71	1,921,015
1909.....	1,256,674	1,767,171		†	.....	3,023,845
1910.....	1,751,359	1,884,442		†	230	3,636,031
1911.....	1,676,923	1,053,420	91,751	462	234	2,822,790
1912.....	2,105,144	1,099,926	119,300	3,455	.....	3,327,915
1913.....	2,527,710	817,591	155,043	2,436	.....	3,502,780
1914.....	1,525,851	323,897	95,169	178	.....	1,945,095
1915.....	1,775,168	326,952	102,083	.....	.....	2,204,203

* Rerolled from old steel rails and renewed rails which the manufacturers could not classify as Bessemer or open-hearth. † Small tonnages rolled in 1909 and 1910 but included with Bessemer and open-hearth rails for these years.

PRODUCTION OF RAILS BY WEIGHT PER YARD, 1897–1915.

Years.	Under 45 pounds.	45 and less than 85.	85 and less than 100.	100 pounds and over.	Total. Gross tons.
1897.....	88,806	1,223,435	335,561		1,647,802
1898.....	123,881	1,404,150	453,210		1,981,241
1899.....	133,836	1,559,340	579,524		2,272,700
1900.....	157,531	1,626,093	602,058		2,385,682
1901.....	155,406	2,225,411	493,822		2,874,639
1902.....	261,887	2,040,884	645,162		2,947,933
1903.....	221,262	1,603,088	1,168,127		2,992,477
1904.....	291,883	1,320,677	672,151		2,284,711
1905.....	228,252	1,601,624	1,546,053		3,375,929
1906.....	284,612	1,749,650	1,943,625		3,977,887
1907.....	295,838	1,569,985	1,767,831		3,633,654
1908.....	183,860	687,632	1,049,514		1,921,015
1909.....	255,726	1,024,856	1,743,263		3,023,845
1910.....	260,709	1,275,339	2,099,983		3,636,031
1911.....	218,758	1,067,696	1,536,336		2,822,790
1912.....	248,672	1,118,592	1,960,651		3,327,915
1913.....	*270,405	†967,313	2,265,062		3,502,780
1914.....	*238,423	†309,865	868,104	528,703	1,945,095
1915.....	*254,101	†518,291	742,816	688,995	2,204,203

* Includes rails under 50 pounds. † Includes 50 pounds and less than 85 pounds.

PRODUCTION OF ALLOY-TREATED STEEL RAILS, 1909–1915.

Years	Total production. Gross tons.	Production by alloys.		Production by processes.		Production by weight per yard.			
		Titanium.	Other alloys.	Open-hearth and elect.	Bessemer.	Under 45 lbs.	45 and under 85 lbs.	85 and under 100 lbs.	100 lbs. and over.
1909.	49,395	35,945	13,450	13,696	35,699	..	9,132	40,263	
1910.	257,324	256,759	565	27,389	229,935	..	70,170	187,154	
1911.	153,989	152,990	999	38,539	115,450	..	27,097	126,892	
1912.	149,267	141,773	7,494	40,393	108,874	21	5,426	143,820	
1913.	59,519	47,655	11,864	33,567	25,952	*91	†9,414	50,014	
1914.	27,937	23,321	4,616	27,447	490	*14	†1,168	8,301	18,454
1915.	24,970	21,191	3,779	24,367	603	*6	†1,977	6,555	16,432

* Includes rails under 50 pounds. † Includes 50 pounds and less than 85 pounds.

PRODUCTION OF ALLOY-TREATED STEEL RAILS, 1915.

Alloys.	Total production.	Production by processes.		Production by weight per yard.			
		Open-hearth.	Bessemer.	Under 50 lbs.	50 lbs. to 84 lbs.	85 lbs. to 99 lbs.	100 lbs. and over.
Titanium.....	21,191	20,588	603	6	1,823	6,186	13,176
Manganese.....	3,779	3,779	...	..	154	369	3,256
Total.....	24,970	24,367	603	6	1,977	6,555	16,432

PRODUCTION OF RAILS, SHOWING INCREASE BY PROCESSES, 1914–1915.

Kinds.	1915.	Per cent.	1914.	Per cent.	Increase.	Per cent.
Open-hearth.....	1,775,168	80.54	1,525,851	78.45	249,317	16.34
Bessemer.....	326,952	14.83	323,897	16.65	3,055	.94
All other.....	102,083	4.63	95,347	4.90	6,736	7.06
Total.....	2,204,203	100.00	1,945,095	100.00	259,108	13.32

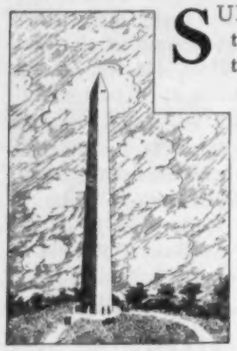
PRODUCTION OF RAILS BY WEIGHT AND PROCESSES, 1915.

Kinds.	Under 50 lbs.		50 to 84 lbs.		85 to 99 lbs.		100 lbs & over.		Total.	
	Gross tons.	Per cent.	Gross tons.	Per cent.	Gross tons.	Per cent.	Gross tons.	Per cent.	Gross tons.	Per cent.
O. H...	120,065	47.25	303,120	58.48	669,830	90.17	682,153	99.01	1,775,168	80.54
Bess ..	48,289	19.00	213,685	41 23	58,136	7.83	6,842	.99	326,952	14.83
Other .	85,747	33.75	1,486	.20	14,850	2.00	.....	.....	102,083	4.63
Total	254,101	100.00	518,291	100.00	742,816	100.00	688,995	100.00	2,204,203	100.00

Business News of Nation's Capital

Armor Plate Bill Will Probably Become Law—Early Decision in Ore Rate Case is Hoped for—Action on Spokane Rate

Washington, D. C., April 11.
206 Corcoran Bldg.,
Bureau of *The Iron Trade Review*,



SUPPORTERS of the administration bill, providing for a government owned armor plate plant have expressed satisfaction over the action last week of the house committee on naval affairs in ordering a favorable report on the bill. The vote was 15 to 6.

At the presonal request of the President, the bill was not amended, but was left in the identical form that it was in when it passed the senate. The President having exercised his personal influence in favor of the measure, and lined up members of the committee who apparently were opposed to it, has led many to the belief that opposition to it in the house will be greatly reduced. Chairman Padgett, of the committee on naval affairs, said the bill would pass easily in the house, and intimated that it will be put through under a special —or gag—rule.

Of the 21 members of the committee, two Republicans, Representative Britten and Representative Stephens, voted with the Democrats to order the bill reported favorably. On an amendment offered by Representative Butler, Republican, proposing that the federal trade commission inventory the plants and set a price at which the government should buy armor from private manufacturers, the vote was 8 for and 13 against it, one Democrat, Representative Callaway, of Texas, voting for the amendment.

Despite the offer of private manufacturers to reduce the price of armor, if given contracts for tonnages required for the proposed five-year naval program, or to let the trade commission fix the price of armor, or to permit public accountants to inventory their plants and allow the secretary of the navy to set the price, based on their data, the committee gives as the only reason for its recommendation the alleged high price paid for armor by this government, a price which is less than any other government pays.

In its report on the armor plate bill, the committee condemns the plan of bidding for and awarding contracts, a custom which was inaugurated by the navy department itself, which also encouraged two of the three private companies to enter into the manufacture of armor plate.

The committee report is unusually brief, and, in part, is as follows:

After the Midvale company had established its ability to manufacture and deliver armor plate to the government, identical bids from all three companies were submitted for the manufacture of armor plate for the government and continued so until the last year or two. Whether this condition was brought about by the navy department in an attempt to keep all plants in business in order that they might be an asset in case of war or emergency or whether by an agreement or understanding among the companies, it has been fully demonstrated to the satisfaction of the committee that competition from abroad and at home has disappeared, and the government finds itself in such a position as to be forced to contract for armor plate at the price submitted by the companies. Many investigations have been had at the instigation of congress to determine the cost of the manufacture of armor plate, and it seems to be demonstrated by these investigations and the reports thereon that the government can manufacture armor plate at a price considerably less than that charged by private manufacturers.

While it is admitted that armor plate is not an article of commercial use and that the government is the only customer for armor plate in the United States, yet it is the opinion of the committee that the government should not be compelled to pay a price set by domestic manufacturers where it has been demonstrated that competition no longer exists. It is, therefore, believed that as a measure of protection against such a condition of affairs the committee should recommend the erection or the purchase of a factory for the manufacture of armor plate for the vessels of the United States navy, and, therefore, recommends that the bill do pass.

Proposed Raise Condemned

Washington, April 11.—In a decision handed down last Saturday, the interstate commerce commission condemned the proposed increase of from 30c to 40c per 100 pounds on iron and steel articles from north Pacific coast points to Spokane, Wash., and other points in the same general territory. Tariffs proposing the increase have been ordered cancelled, on or before May 12, they having been suspended until that date.

Prior to April 25, 1913, the rate on structural iron and steel, the principal articles involved, from north Pacific coast terminals to Spokane and points taking the same rates was 50c, which is the fifth class rate; and structural steel is rated fifth class in the western classification. Fabrication in transit was then provided for at Missouri river points on shipments from certain eastern defined territories to points east of the Idaho and Washington state line, but was not allowed on shipments destined to points west of that line. In April, 1913, fabrication in transit was extended by certain of the northern lines to shipments from Pittsburgh, and other points in eastern territory in groups A and B destined to points west of the line mentioned, including Spokane and Spokane territory. At that time the rate to the north Pacific coast on these articles, fabricated or unfabricated, was 80c, and the rate to Spokane was $1.08. Iron and steel articles were then being shipped to the coast, fabricated at coast points, and reshipped to Spokane. In order to permit the coast fabricators to continue to compete at Spokane with eastern fabricators, a commodity rate of 30c was established on structural iron and steel from the coast to Spokane. The total transportation charge on structural iron and steel from Pennsylvania to the coast, when fabricated and reshipped to Spokane, was therefore the sum of 80c and 30c, or $1.10. If the fabrication occurred at Missouri river points, the total charge was the sum of $1.08, the rate to Spokane, and 1.5c for fabrication, or $1.095. At that time, and during a period of 15 or 16 months after the 30c rate was established, the great bulk of the structural iron and steel from eastern territory to the Pacific coast moved all rail. With the opening of the Panama canal in August, 1914, rates on these articles via water from the Atlantic to the Pacific coast were greatly reduced and fabricators on the Pacific coast made heavy shipments from the Atlantic seaboard by water. Some of the articles, after fabrication, were reshipped to Spokane on the 30c rate. Confronted apparently with a

serious shrinkage in business to the Pacific coast by reason of the competition of boat lines operating through the Panama canal, the transcontinental rail carriers sought and obtained authority from the commission to reduce their rates on many commodities, including iron and steel articles, from eastern defined territories to Pacific coast and intermediate points. It was provided that in any instance in which the commodity rate to the Pacific coast plus 75 per cent of the local rate from the terminal eastward to destination amounted to less than the maximum named, the lower rate should control. The rate from Chicago to the coast is 55c, and from the coast to Spokane it is 30c. The 55c rate to the coast plus 75 per cent of the 30c rate is 77.5c. This is the authorized rate to Spokane. The rate at present applied, however, is 85c, which the commission says creates a discrimination against Spokane, which is undue and in violation of the order of the commission.

"Under the present situation, with the Panama canal temporarily unavailable and the enormous demand for ships in the European trade," says the decision, prepared by Commissioner Clements, "it seems unlikely that in the near future any great amount of this traffic will move by water from the Atlantic seaboard to the Pacific coast at any rate less than 40c. Therefore, one of the grounds relied on by the carriers for the increase in this rate, namely, the protection of their revenues by such an adjustment of rates as would induce the direct movement of this traffic to Spokane, does not now exist.

"The direct rate of 77.5c, Chicago to Spokane, it is stated, authorized by the commission, plus the fabricating charge of 1.5c, will produce a rate of 79c to that point. There is declared to be no present likelihood of the establishment of any aggregate rail-water-and-rail rates from iron producing territory to Spokane that will divert any substantial amount of traffic fro mthe direct rail lines."

Argued Ore Rate

Washington, April 11.—Arguments were made last Friday before the interstate commerce commission in the case relating to rates on iron ore from lower Lake Erie ports to furnaces in western Pennsylvania, Ohio, West Virginia and Kentucky. The case covered a general investigation of the ore rate structure of the important territory involved, and grew out of individual complaints and decisions, the situation having been found so generally unsatisfactory that the commission consolidated all the cases into one. The first complaint that was included in the investigation was filed in January, 1912, by independent iron and steel interests of the Mahoning and Shenango valleys of Ohio and Pennsylvania, respectively, protest being made against the rate of 56c per ton on direct ore. These companies were represented by Attorney Richard Jones Jr.

It is understood that the commission hopes to render an early decision in the case, so that any readjustment of rates that may be made will affect prices shippers will pay for ore this season.

Attorney Wade H. Ellis appeared at the arguments for the Pittsburgh Steel Co., Pittsburgh, and the Wheeling Steel & Iron Co., Wheeling, W. Va., and maintained that the rate of 88c per ton applying to those two points is an unjust discrimination in favor of other points involved in the proceeding. In his argument on behalf of the Jones & Laughlin Steel Co., Pittsburgh, Attorney George Wilson said that the Pittsburgh rate district is too large and should be divided, with lower rates to those points which are the shorter distance from the lake ports. Attorney Frank Lyon appeared for furnace interests in the Hanging Rock, O., district and asserted that that district does not get an advantageous rate as compared with the prevailing Pittsburgh and Wheeling rate.

It was maintained that the commission is taking up the question of distances, should consider the haul from the mouth of the ore mines to the furnaces, rather than from lower lake ports to the furnaces. Attorneys for Pittsburgh and Wheeling shippers indicated that they thought the rate to those points should be reduced to 60c, the rate which applied to Wheeling before the present rate of 88c was established. Mr. Jones said that when the rate of 96c to Pittsburgh was reduced to 88c, no reduction was made in the valleys rate, but that if they had been given a similar reduction at that time, it would have been 48c, and maintained that if rates are lowered by the commission, the valleys rate should be given a reduction under 48c, corresponding to that granted the other points. He gave notice that the companies he represents have withdrawn their request for reparation included in the complaint filed a little more than four years ago.

Attorney M. A. Parker, representing the Baltimore & Ohio, made the principal argument for the carriers, and contended that the existing ore rates to all points involved are on a proper basis.

Cambria Additions

Includes One Blast Furnace and Three Open Hearths

A number of improvements at its several plants formally were authorized by the Midvale Steel & Ordnance Co. at the monthly meeting of the directors at New York, April 5. The most important of these improvements will be made at the plant of the Cambria Steel Co. and will consist of one modern blast furnace, three additional open hearth furnaces, extensions of the electric power and boiler plant and other enlargements. Some further improvements of a miscellaneous character also were ordered for the plants of the Midvale Steel Co. and the Worth Bros. Co. Three new directors were added to the board. These are E. E. Slick, John C. Neale and W. B. Dickson.

Bullard Company's Building

Contracts have been placed with the Turner Construction Co., New York City, by the Bullard Machine Tool Co., Bridgeport, Conn., for a continuation on Railroad avenue of that city of the concrete building now completing which extends from Allen street to Railroad avenue on Broad street. The present structure is 278 feet long, five stories, 50 feet wide. The new building is of similar construction, 110 feet long, and will replace the 4-story brick machine shop which now occupies the site, adding largely to the company's manufacturing facilities.

The transfer of R. & T. Fairbanks & Co.'s business, St. Johnsbury, Vt., to the Fairbanks, Morse & Co., Chicago, has been completed. The new interests have elected the following directors: C. H. Morse Jr., W. E. Miller, H. J. Fuller, Thomas McMillan and W. S. Hovey, all of Chicago, succeeding Henry C. Ide, Joseph Fairbanks, A. H. McLeod, Charles A. B. Pratt and C. L. Harpham, St. Johnsbury. The directors have organized as follows: President, Frank H. Brooks, St. Johnsbury; vice president, C. H. Morse, Chicago; secretary, John C. Clarke, St. Johnsbury; treasurer, Fred C. Beck, St. Johnsbury; engineer, J. H. A. Bousfield; superintendent, A. E. Ashcraft, Beloit, Wis.; factory accountant, C. B. Rathbun, Beloit, Wis.

The Bottles Machinery Mfg. Co., 3100 South Kedzie avenue, Chicago, has changed its name to the Federal Brass Works.

Iron and Money: Fact and Comment

Wall Street Awakens Slowly to the Fact That This is a Presidential Year—Most Stocks Make Moderate Gains

INTERNATIONAL affairs have so completely dominated the market that until very recently there was hardly a hint in Wall street that a President is to be elected this year, but a few days ago, when prices were rising, some writers of bulletins to be telegraphed over the country said there was a "Roosevelt market." This was purely imaginative, but it has started some gossip as to the probable effect of the presidential campaign on the trend of market events. *The Evening Post*, of New York, remarks that as a matter of fact Wall street does not usually begin to get nervous or enthusiastic over a presidential campaign until the approach of the national convention in June or July. It recalls that an exception was in 1896, when the silver issue alarmed the country. In that year, by midsummer, politics was almost the only topic in the financial district. But politics has not played such an important part in business at any time since 1896 and it is not expected that it will do so this year.

During the past week, there have been some moderate ups and downs in the market, but, for the most part, stocks connected with the iron and steel business recorded gains.

Quotations at the close of business April 8 and net changes in the leading stocks identified with the iron and steel industry for the week as shown in the following table:

	Close Apr. 8.	Net chg.
American Can	60	—1⅜
American Can, prfd.	111⅞	+ ⅛
Amer. Car & Fdy.	68	—1⅜
Amer. Car & Fdy., prfd.	116¾	+ ¾
American Locomotive	77¼	—2¼
American Locomotive, prfd.	102½	.....
American Steel Foundries	52½	+1
Baldwin Locomotive	106¼	+1⅜
Baldwin Locomotive, prfd.	108⅝	— ⅛
Bethlehem Steel	479	—11
Bethlehem Steel, prfd.	135	.....
Colorado Fuel & Iron	44⅛	— ⅞
Continental Can	84	+1¼
Crucible Steel	91⅛	—3¼
Crucible Steel, prfd.	116½	+ ¼
General Electric	165½	— ⅝
International Harv. of N. J.	111	+ ½
Internat'l Harv. of N. J., prf.	119⅜	+1⅜
Internat'l Harv. Corp.	72	—1
Lackawanna Steel	77½	+ ¾
Nat'l Enamel'g & Stmp. Co.	24⅝	+ ⅝
Nat'l En. & Stmp. Co., prf.	96	+1½
Pressed Steel Car	52	— ¾
Pressed Steel Car, prfd.	103	+1
Pullman Palace Car	163	+2
Republic Iron & Steel	50¾	— ¼
Republic Iron Steel, prfd.	108⅝	+ ⅛
U. S. Cast Iron Pipe & Fdy.	21½	+ ⅛
U. S. C. I. P. & F. Co., pr.	51¼	— ¾
United States Steel	84½	—1⅛
United States Steel, prfd.	117⅛	+ ⅜
Westinghouse Mfg.	63¾	—1⅜

The following table shows changes in maximum quotations of stocks not listed on the New York stock exchange:

	High April 7.	High March 31.
American Radiator	395	397
American Ship Building	46¾	48¼
Cambria Steel	81¾	81¼
Chicago Pneumatic Tool	74	74
LaBelle Iron Works	55½	53¾
Lake Superior Corpn.	10⅜	10⅞
Pennsylvania Steel	80	80
Stewart-Warner Speed Co.	87¼	88
Warwick Iron & Steel	10¾	10¾
Westinghouse Air Brake	137	139½
Westinghouse Elec. & Mfg.	66	66½

Nearly 100 Per Cent

Reports submitted at the annual meeting of the Colt's Patent Fire Arms Mfg. Co., in Hartford, Conn., April 1, showed gross earnings for 1915 of $2,827,328 and unfilled orders of $22,554,245, with others pending. The orders are non-cancellable. The net earnings amounted to $2,470,944, nearly 100 per cent on the capital stock of $2,500,000, and the net surplus to $1,897,026, after the deduction of dividends, which amounted to 24 per cent for the year. The present rate of dividend is 10 per cent, regular, and 40 per cent, extra, making a total of 50 per cent a year. The net surplus for 1914 was only $26,000. The unfilled orders in 1914 amounted to $2,030,000. Orders on hand are sufficient to run until April 1, 1917, being from nine foreign governments. During the year $700,000 worth of new machinery was ordered, 90 per cent of which has been delivered. The number of employes is 1,977 against 1,285 last year.

The election of officers resulted as follows: President, C. L. F. Robinson; first vice president, William C. Skinner; vice presidents, C. F. Nichols and S. M. Stone; treasurer, Walter H. Penfield; assistant treasurer, H. D. Fairweather; secretary, A. L. Ulrich; directors, William C. Skinner, Chas. L. F. Robinson, Frank A. Schirmer, Charles M. Jarvis, Louis R. Cheney, Morgan C. Bulkeley and D. Newton Barney.

New Record

Clearinghouse exchanges of bank checks in the United States during the month of March amounted to $20,679,675,539, a new high water mark in our history. The total was 49 per cent over the corresponding month in 1915. New York's total was slightly below the record of last October, but was 65.9 per cent above March, 1915. Philadelphia's gain was 53.7 per cent, Pittsburgh 32.5, Boston 42.8, St. Louis 21.3, Chicago 24.9, San Francisco 22.4, and Kansas City 21.6. Bank clearings in the United States last week were 12.4 per cent above the previous week and 45.4 per cent above a year ago. New York's gain over 1915 was 61.9 per cent.

Commercial failures last week in the United States, as reported by R. G. Dun & Co., were 342, against 381 the previous week and 473 the corresponding week last year. Failures in Canada numbered 35, against 40 the previous week and 35 last year. Of failures last week in the United States, 117 were in the east, 94 south, 76 west and 55 in the Pacific states, and 102 reported liabilities of $5,000 or more, against 126 the previous week.

Canadian Earnings

That Canadian steel companies, like American concerns, are benefitting greatly from the changed conditions in the steel trade, is indicated by the annual report of the Steel Co. of Canada, Hamilton, Ont. The report shows a surplus from operations in 1915 equal to $1,756,211 or 15.27 per cent on the issued common stock, compared with a deficit of $313,172 in 1914. This was after providing all necessary depreciation allowances and bond interest as well as four quarterly dividends on the preference stock. The income accounts of 1915 and 1914 compare as follows:

	1915.	1914.
Profits after allow. for repairs, maintenance & improvements	$3,230,452	$539,811
Funds for deprec., renewal and improvem't	400,000	.....
Sink'g fund, half year	88,500	.....
Total	2,741,952	539,811
Less interest on bonds.	531,000	521,138
Underwriting charges	.....	104,475
Balance for dividends	2,210,952	*85,802
Preference dividends	454,741	227,370
Bal. left for com. div.	1,756,211	*313,172
P. and L brought for'd.	1,258,431	1,571,603
P. and L. carried for'd.	3,014,642	1,258,431

*Deficit.

The accounts for 1915 showed no entry under the head of repairs and improvements, although $341,000 was thus charged off in 1914. However, the 1915 report shows the sum of $400,000 written off for depreciation, renewals and improvements. No change appears in the capitalization of the company,

the preference stock amounting to $6,496,300 and the common to $11,500,000, a total of $17,996,300. Bonded indebtedness amounts to $8,850,000, unchanged, while there are $1,200,000 convertible promissory notes, the first of which falls due in two years. In the matter of assets, the cost of works now owned and operated is shown at $24,528,088, while current liabilities have increased $949,875, chiefly in accounts payable.

Of the gross sales in 1915, 55.2 per cent represented purely domestic trade, the balance being war munitions and exports. Since the compilation of the report the company wiped out all its unpaid accumulated dividends and may now apply its surplus profits to whatever object is deemed advisable to the directors.

Financial Notes

The Whitaker-Glessner Co., Wheeling, has sold Lee, Higginson & Co., New York bankers, a new issue of $3,000,000 first and refunding mortgage 5 per cent 25-year sinking fund gold bonds, subject to ratification by the stockholders of the company. The company has plants at Wheeling, Martins Ferry, O., and Portsmouth, O., and has annual capacity of about 250,000 tons of finished steel products. It also owns the Wheeling Corrugating Co., with plants at Wheeling and Martins Ferry. The proceeds of the issue will pay off $1,300,000 existing bonds and supply over $1,500,000 for additions to other plants. It is said one of these additions includes building a blast furnace at its Portsmouth, O., steel plant.

The Woodard Machine Co., Wooster, O., of which L. A. Woodard, formerly general manager of the William Tod Co., Youngstown, O., is president and principal owner, has purchased the Foundries Co., Orrville, O. The properties of the latter company include two brick buildings, the foundry proper, 60 x 180 feet and power house. The company has much business booked, the principal line being machinery to be used in a process for separating the elements of crude oil for chemical manufacture. Gears also will be manufactured. The Woodard company will produce its castings at Orrville and machine them at Wooster.

Heulings Lippincott, receiver for the Camden Iron Works, Camden, N. J., has been directed by an order of the federal court at Trenton, N. J., to pay the interest due in December and June on the 1915 coupons. He also was ordered to withhold $202,000 due the Florence Iron Works until the affairs of that concern are wound up. Harold B. Wells, receiver for the Florence company, has been directed to file his report May 1, and May 13 has been fixed by the court for a hearing of persons interested in the final settlement.

William G. Laidley, one of the receivers appointed for J. V. Thompson, former banker and coal land owner of Uniontown, Pa., recently filed a petition in bankruptcy in the United States circuit court at Pittsburgh, giving his liabilites as $208,738 and assets as $112,110. Mr. Ladley, who is a farmer, lives at Charmichaels, Pa., and owns coal lands in Greene county. He formerly was closely associated with Mr. Thompson.

Chattanooga Steel Plant

Billets and Slabs Will Be Immediate Product— Finishing Mills to be Added Later

(Staff Correspondence.)

Chattanooga, Tenn., April 10.—A preliminary layout of the new plant of the Chattanooga Steel Co. has been completed, although many details remain to be settled. "For the time being," said W. T. James, vice president of the company to a representative of *The Iron Trade Review*, "we will convert cold pig iron and scrap in our two 75-ton basic open hearth furnaces and sell the resulting steel in the form of 4 x 4-inch billets and slabs. As rapidly as possible, we expect to add finishing mills, the exact nature of which will depend on market conditions, our aim being to provide a well rounded plant with a diversified output that will fit into the needs of this community. Our blooming mill will have a capacity of 1,200 tons daily, and we expect before long to start building four additional open hearth furnaces to absorb this capacity."

Details of Finishing Mills

Unofficially it is intimated that the finishing capacity will include a 63-inch combination two-high plate and sheet bar mill, driven by a reversing motor, 18-inch and 10-inch merchant mills equipped to roll bars and small shapes, and half a dozen sheet mills. The plate mill will be provided with vertical rolls for turning out universal plates and sheet bars which, of course, are nothing more than narrow plates. This mill will have horizontal rolls approximately 30 inches in diameter.

The plant is located on a 100-acre tract northeast of the city of Chattanooga. The ground slopes slightly toward the river and excavations will be necessary. The various units will be arranged practically on a straight line in their proper sequence.

The building for the two open hearth furnaces, now under construction, is 140 x 180 feet. The stock yard will be located alongside the furnace building. The open hearth department will be followed by two 4-hole soaking pits with a capacity of six ingots per hole. Two more pits will be erected upon the construction of the four additional furnaces. Five 10½-foot gas producers will be provided for the two open hearths, with two additional producers for the pit furnaces.

Blooming Mill Equipment

The two-high blooming mill, which has been ordered from the National Roll & Foundry Co., Avonmore, Pa., will have 34-inch rolls and will be driven by a Westinghouse reversing direct-current motor operating in conjunction with a motor-generator set. The electric power for the main rolls and for all other purposes throughout the plant will be furnished by the Tennessee River Power Co., Chattanooga, at 6,600 volts, 60-cycle, 3-phase. The blooming mill is designed for an output of 60 tons per hour, rolling from an 18 x 20-inch, 3-ton ingot to a 4 x 4-inch billet. Slabs also will be rolled in the blooming mill and possibly large rounds.

Ample crane equipment will be provided. At the outset the ingot molds will be poured on the floor, cars being dispensed with. Later ingot cars of the ordinary type will be purchased and a standard stripping crane provided.

The plant is being laid out and erected under the supervision of W. R. Miller & Co., consulting engineers, Pittsburgh, with William Millward, construction engineer, in charge at Chattanooga.

The Sykes Metal Lath & Roofing Co., Warren, O., has purchased the metal lath department of the Garry Iron & Steel Co., Niles, O. In addition to operating the Niles plant, plans are being made to double the capacity of the plant at Warren. The Sykes company now manufactures the following styles of Lath: "A" and "B" grades Cleveland expanded metal lath; Garry (Diamond) expanded metal lath; Sykes expanded cup lath and Sykes trough sheet lath.

MEN OF THE IRON TRADE

Who they are Where they are What they are doing

L. B. Morris, who has been district sales manager at New York of the Cambria Steel Co., has been made manager of sales of the New York district for the Cambria Steel Co., the Midvale Steel Co. and Worth Bros. Co., with headquarters at 165 Broadway. H. W. Hayes has been made manager of sales for the three companies in the Boston district, with headquarters in the Massachusetts building. Mr. Hayes has been district sales manager at Boston for the Cambria Steel Co. Edson S. Harris, who has been in charge of the export department of the Midvale Steel Co., has been made manager of sales of the three companies in Philadelphia territory, with headquarters in the Widener building. J. E. McLain, who has been district sales manager for the Cambria Steel Co. at Pittsburgh, becomes manager of sales of the three companies in that district, with offices in the Oliver building.

Mr. Morris has been connected with the sales organization of the Cambria Steel Co. and its predecessor, the Cambria Iron Co., during practically all his business career. After receiving his education in the public schools of New York City, where he was born June 6, 1873, Mr. Morris entered the employ of the Cambria Iron Co. as an entry clerk on April 19, 1893. Promotions to assistant sales agent June 16, 1900, and to New York sales agent in 1902, followed successively. On April 1, 1912, he was placed in entire charge of the New York office of the Cambria Steel Co. with the title of district sales manager. Mr. Morris is a member of the American Iron and Steel Institute, the Railroad Club of New York City and other organizations.

Roger R. Griswold, of Meadville, Pa., has been appointed mechanical engineer for the interstate commerce commission.

C. M. Wolley, president of the American Radiator Co., has been elected a director of the American Cotton Oil Co.

Clyde M. Carr, president of Joseph T. Ryerson & Son, New York, Chicago & St. Louis, is in Santa Barbara, Calif., and will return to Chicago early in May.

W. G. O'Malley, general master mechanic of the Pittsburgh Crucible Steel Co., Pittsburgh, with works at Midland, Pa., entertained superintendents of the mill April 1 at the Pittsburgh Athletic Club. Following a banquet several informal talks were enjoyed.

Thomas Dunbar, for 30 years general manager of the mechanical department of the Pullman Co., Chicago, has retired. His successor has not been chosen.

P. J. Cornelissen, formerly operating the Boston Metal Co., Boston, Mass., which was destroyed by fire, is now in charge of the foundry of Merriman Bros., Boston.

L. B. MORRIS

R. C. Kirk, president; H. D. Westfall, vice president; G. B. Levan, general manager; George Greer, chairman of the board; D. A. Burt, treasurer, and W. E. Beswick, secretary, were reelected to office at a recent meeting of the directorate of the La Belle Iron Works, Steubenville, O.

Howard Newlin, traffic manager of the Pennsylvania Steel Co., has resigned to accept the position of special representative in charge of freight matters of the Maxwell Motor Co. effective April 1. Mr. Newlin is president of the Philadelphia Traffic Club and has been prominent in eastern traffic circles. His headquarters will be in Detroit.

Dr. Walter F. Rittman has resigned from the United States bureau of mines to perfect the organization of the Rittman Process Corporation, which will manufacture gasoline, phenol, picric acid and other chemicals by the Rittman process. The company has obtained the plant of the Island Petroleum Co., on Neville Island, Pittsburgh. Dr. F. L. Slocum is president and Dr. Rittman is vice president of the organization, which has offices in the Empire building, Pittsburgh.

J. C. Drumm, formerly connected with the efficiency department of the Carnegie Steel Co., at Duquesne, Pa., has accepted the position of supervisor of installation in the efficiency instrument department of the Scientific Materials Co., Pittsburgh.

C. H. Todd, president of the Petroleum Iron Works Co., and E. F. Woodsmith, president of the Pennsylvania Tank Car Co. and the Pennsylvania Tank Line Co., subsidiaries of the Petroleum company, which have works at Sharon, Pa., has resigned. J. P. Sweeney, treasurer of the three companies, and John Slater, a member of the board of directors, also have resigned. George P. Bard, general sales manager, has been appointed president of the Petroleum Iron Works Co. and Osborne Mitchell has been appointed president of the Pennsylvania Tank Car Co. and the Pennsylvania Tank Line Co.

I. L. Houghton, who has been connected for the past 10 years with the United States Malleable Iron Co., Toledo, O., as assistant treasurer, production manager, and also with sales and management of the affairs of the company, has resigned. Mr. Houghton has been interested in the foundry business for about 25 years, having previously served in various capacities with the National Malleable Castings Co., Toledo, the Michigan Malleable Iron Co., Detroit, and the Grand Rapids Malleable Iron Co., Grand Rapids. Mr. Houghton also holds the position of secretary and treasurer of the Superior Iron & Mfg. Co., but is not actively engaged in the management of the affairs of the company. No definite plans have been made for the future, but he will probably follow the same line of business with which he has heretofore been connected. Upon his resignation, 30 of his associates presented Mr. Houghton a beautiful loving cup.

News of Employers and Employes

John D. Rockefellow Jr., Co-operates in Community Welfare Work in Colorado—Milwaukee Elects Socialist Mayor

JOHN D. ROCKEFELLER JR., himself a Baptist, has agreed to contribute toward the erection of a Roman Catholic Church at Berwind, Colo., one of the coal camps of the Colorado Fuel & Iron Co. Mr. Rockefeller has also expressed a willingness to co-operate in building a Protestant or a Catholic church, or both, in every Colorado Fuel & Iron camp where the need of and desire therefor has been manifested by a sufficient number of residents of the community to assure adequate support and permanence of worship.

In agreeing to contribute toward the erection of churches, Mr. Rockefeller has stipulated that neither he himself nor the company shall assume any responsibility for or control over them. "Any church work to be successful must be organized and controlled by the community in which it is situated." Mr. Rockefeller wrote to the officers of the company, in connection with his first gift for this purpose.

The Colorado Fuel & Iron Co. will lease at a nominal rental to the congregation at Berwind a site on company property for the new church which is to be erected there. The leased tract is to be under sole control of the Roman Catholic church so long as it is used for church purposes

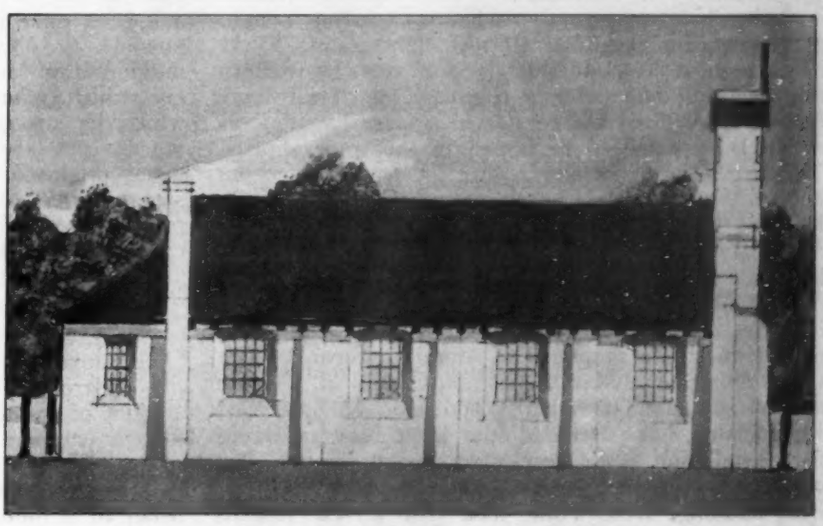
In carrying out the scheme of co-operation outlined in the industrial representation plan adopted by the Colorado Fuel & Iron Co. and its employes after Mr. Rockefeller's visit to Colorado last fall, the company is providing additional bath and club houses. Mr. Rockefeller personally agreed to erect an emergency hospital at the coal camp at Primero, Colo., and at the iron mining camp at Sunrise, Wyo.

Considerable care has been devoted to the design of the new Catholic Church to be erected at Berwind, for it is expected to serve as a type tor church buildings in other camps. The plan evolved was that of a Spanish mission type of building, constructed of cement blocks and covered with white stucco. It is contemplated that in every mining camp the church buildings shall be the dominating structures, both in location and architectural treatment. It is believed that the influence for good exerted by the churches will be enhanced if the structures are both dignified and simple. For the Protestant churches there will be selected a different design from that adopted for the Catholic church edifices, though one equally pleasing and appropriate.

The Recent Election

Milwaukee, April 10.—Milwaukee elected its second Socialist mayor on April 5, when Daniel W. Hoan, who was chosen city attorney in the Socialist landslide in 1910, defeated Dr. G. A. Bading for re-election to a third term. The election of Mr. Hoan is not considered anything like a Socialist victory, for the non-partisan ticket, with the exception of mayor, won by large majorities over the Socialist candidates. In 1910, when Emil Seidel was elected as the first Socialist mayor of Milwaukee, he carried the entire ticket with him and the city was under the domination of the Socialist party for two years. In 1912, the old parties combined and wrested control of the city government from the Socialists, and they repeated in 1914.

The election of Socialist Hoan is not believed to forecast the ill effects which people outside of Milwaukee would make themselves and others believe will result. This is especially true because of the overwhelming defeat of other Socialist candidates, leaving the mayor practically alone and subject to the control of a common council that is non-partisan by a large majority. It was stated in Milwaukee before election that a general victory for the Socialists would greatly strengthen the probabilities of a general demand among union workmen for shorter hours and higher wages on May 1, because of the confidence a victory of this kind would create. While the danger of an uprising is not believed to be past, employers are not nearly so apprehensive as before the election. The labor unions have been working under cover for many months and numerous professional agitators brought here to promote organization work, particularly among machinists. What the end of this month will bring is a matter of conjecture.



PROPOSED ROMAN CATHOLIC CHURCH AT BERWIND, COLO.

Men employed in the mines of the Allegheny and Kiskiminetas valleys who went on strike April 1, have returned to work. About 1,000 men employed by the Ellsworth Collieries Co. and the Pittsburgh Westmoreland Co. went on a strike April 1 and have not returned to work.

The Bridgeport Brass Co., Bridgeport, Conn., has given all its employes a bonus of 5 per cent of the wages received for the quarter ending April 1. It amounts to about $30,000.

Home Needs Climb to High Level

Foreign Inquiry for Equipment Continues But Local Markets Offer Big Field—Several Tool Lists Have Been Issued

THE MACHINE tool market in the east is characterized by a good inquiry from domestic industries generally, although there are few transactions of importance. There is some export demand but this is of diminishing proportions. A leading machine tool house reports that where its export sales a few months ago formed 75 per cent of its business, such sales now constitute only about 25 per cent of the total. At the same time, however, there is a considerably heavier demand from abroad for heavy machinery, such as cranes, steam hammers, etc. There now is a big steam hammer inquiry in the market from Norway. The Neptune Meter Co., Long Island City, through its subsidiary, the Liberty Arms & Fuse Co., continues in the market for large numbers of machine tools for use in making time fuses; at the present time this concern is considering bids on 50 to 100 additional tools. Levering Bros., Baltimore, are taking bids on considerable additional equipment. The Laconia Car Co., Laconia, N. H., is taking bids on several machines, including a light gate shear, for shearing 3/16-inch light plates. There have been a few additional purchases by eastern railroads, but none of importance. One of the large eastern trunk lines has completed a large list of tools which is expected to be issued to the trade shortly. The largest crane inquiry before the trade is one put out by Westinghouse-Church-Kerr & Co., New York, for two 125-ton, five 15-ton, two 10-ton and one 50-ton crane for installation in new shops to be built at Burlington, Ia., for the Chicago, Burlington & Quincy railroad. This road is expected to issue inquiries for a large amount of new equipment shortly for these shops. The American Steel & Wire Co., Worcester, Mass., has purchased a 7½-ton magnet crane. The Alan Wood Iron & Steel Co., Philadelphia, has purchased four large Morgan cranes for installation in a new open hearth plant. The cranes on which the Russian commission in the Flatiron building, New York, took bids a few months ago, have not yet been awarded. The Pennsylvania Ship Building Co., Philadelphia, and Samuel L. Moore & Sons Corporation, Elizabeth, N. J., have placed orders for considerable additional equipment.

Numerous Improvements Which Are Planned

The following eastern concerns are getting ready to expand their capacity: American Locomotive Co., which will build a cylinder shop at Schenectady, N. Y.; Wickwire Steel Co., which will build a by-products coking plant at Buffalo; International Oxygen Co., Newark, N. J.; Buffalo-Union Furnace Co., which will build a by-products coking plant at Buffalo; Seaboard Air Line, which will build shops at Howells, Ga.; Ingersoll-Rand Co., Easton, Pa.; Warren Foundry & Machine Co., Phillipsburg, N. J.; Covert Mfg. Co., Lockport, N. Y.; Elk Fire Co., St. Marys, Pa.; R. E. Dietz Co., 60 Laight street, New York; H. H. Franklin Mfg. Co., Syracuse, N. Y.; Niagara Search Light Co., Niagara Falls, N. Y.; Northern Brass Co., Spencer, Mass.; Standard Underground Cable Co., Perth Amboy, N. J., and the Balbach Smelting & Refining Co., Newark, N. J.

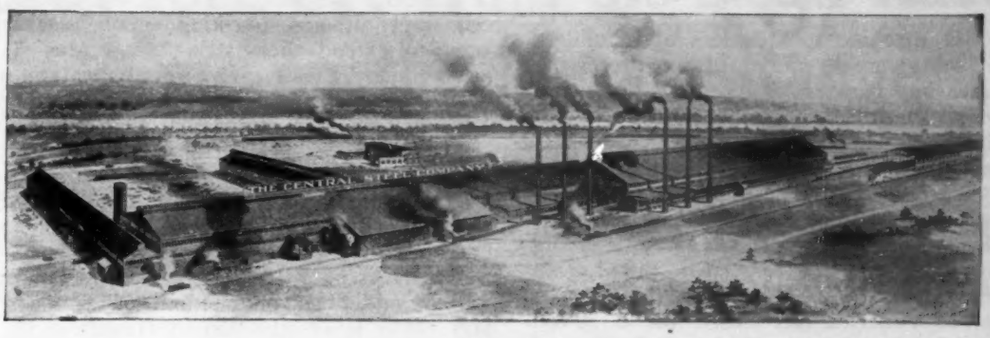
Chicago's Domestic Trade Brightening

A BETTER inquiry for tools for domestic use, especially locally, is being manifested at Chicago. Several important lists are now being figured upon, including that of the Midland Valley railroad, with headquarters at Muskogee, Okla., the Inland Steel Co., for its Indiana Harbor Works, and a few tools for the Santa Fe railroad, the detailed requirements appearing in the following pages. With unusually heavy building operation being undertaken at Gary and South Chicago, by various subsidiaries of the United States Steel Corporation, considerable machinery probably will be bought at a later date to equip machine shops for the various plants. These requirements have not appeared. General buying is excellent, although in some lines, where requirements are difficult to fill, buyers have ceased to inquire. Some deliveries have improved considerably and it is now possible to obtain certain equipment for delivery ranging from May to August. Some sizes of machinery which manufacturers discontinued for a time while the strongest pressure was being exerted for other sizes, are being resumed, and deliveries are being promised for late summer. This applies in some degree to small lathes. Deliveries on drill presses are still being delayed, especially machines equipped with ball bearings, on account of the scarcity and high prices of these fittings.

Cleveland Market Healthy, Though Quiet

THE machine tool market in the Cleveland district is strong. While it is true that there is a certain amount of cautiousness being displayed by purchasers of new equipment, it is a healthy cautiousness devoid of any suspicion that this market will slump suddenly. Deliveries are becoming more normal and it is the belief of a number of local dealers that builders are recognizing to a greater degree the future asset in domestic business. Foreign sales, while pouring a flood of orders into this country, are being recognized as more or less of a temporary nature. The lasting business to which the builder is realizing he must eventually turn is the home consumption. One Cleveland dealer reports that deliveries on large-swing lathes have become practically normal, and that while at rare intervals 30 days are asked by the manufacturer, for the most part shipments are made in 10 days to two weeks. There are no instances of large individual buying, but the total volume of business received from the small manufacturer is good.

The Cleveland Milling Machine Co., 318 Engineers building, Cleveland, recently purchased a 7-acre tract of land in Cleveland and has had plans prepared for a 100 x 200-foot plant. The Samuel Austin Co., Cleveland, is the builder. The structure will be built on the Austin unit system. The Cleveland Milling Machine Co. will build cutters, special tools and milling machines. F. S. Shields, formerly of the National Tool Co., Cleveland, is president, and J. A. Camm,



A Dependable Organization

Because the ancient Greeks were so thorough, they excelled in everything—art, literature, philosophy and athletics. From childhood neither mind nor body was slighted.

"AGATHON"—or ***"highest quality"*** was the goal of each individual—was the goal of each state in the nation.

The complete working force of The Central Steel Company, both office and shop, is made up of specially trained men whose sole duty it is, each one, to see that his particular part in our tremendous organization is performed with perfection.

This splendid body of alert and progressive men, working in as complete and up-to-date a plant as was ever built, and assisted by every conceivable convenience, is producing steel of unprecedented quality—"AGATHON" STEEL.

If you desire steels of highest quality

"Agathon" Steels Will Serve Your Purpose Best

Any shape you wish

Bars, plain or special for cold drawing or machining.

COLD ROLLING STRIP STOCK
BILLETS SLABS BLOOMS

WE MAKE

"AGATHON" Chrome Nickel	"AGATHON" Vanadium
"AGATHON" Chrome Vanadium	"AGATHON" Silico-Manganese
"AGATHON" Nickel Steels	"AGATHON" Chrome Steel
"AGATHON" Special Analyses	"AGATHON" High Carbon

Our shipping facilities are favorable to speedy delivery anywhere

THE CENTRAL STEEL COMPANY

MASSILLON, OHIO

DETROIT OFFICE—326-27-28 Ford Building, F. Walter Guibert, District Representative.
CLEVELAND OFFICE—Hickox Building, The Hamill-Hickox Co., District Representative.

formerly of Kearney & Trecker, Milwaukee, is vice president. All the equipment has been purchased. It is planned to have the new plant in operation about May 1. About 100 men will be employed at first.

Pittsburgh Interests Find Market Active

PITTSBURGH machine tool dealers and builders of heavy rolling mill equipment are receiving a steadily increasing number of domestic inquiries. While the general market is not so excited as it was a few months ago when demand for lathes was abnormally heavy, yet the volume of business in the aggregate is now very satisfactory. As briefly reported a week ago, the Alliance Machine Co., Alliance, O., has received a contract for 14 cranes, having lifting capacities up to 125 tons, for the Lorain works of the National Tube Co., Lorain, O. The Aluminum Co. of America has closed for a 50-ton Cleveland crane for its plant at Whitney, S. C., and it is understood to have purchased some equipment for its works at East St. Louis, Ill. The Crocker-Wheeler Co., Ampere, N. J., has received an order for motor equipment for the by-product coking plant of the Gulf States Steel Co., Alabama City, Ala., being erected by the H. Koppers Co., Pittsburgh. The Shelby Steel Tube Co. has entered the market for four electric traveling cranes for an extension to its plant at Ellwood City, Pa. The National Steel Casting Co., which is building a foundry at New Cumberland, W. Va., has entered the market for one 5-ton and one 10-ton electric crane. Builders of this equipment are unable to promise deliveries in less than from four to eight months.

Shops Unhampered by Labor Strife

IN CINCINNATI, the labor situation remains unchanged. Machine shops have full forces of workmen, and although striking union machinists have voted to extend their strike until May 1, none of those employed has given any indication of leaving his work. More machinists are employed in machine shops in Cincinnati at present than before the strike was called in October, 1915, and employers appear to have the situation well in hand. Much interest is being centered upon the situation in Columbus, O., where union machinists have made demands for a nine-hour day with no reduction in pay from the present basis of a 10-hour day, with a Saturday half holiday, and time and one-half on Sundays and holidays. The labor situation in Hamilton, O., has been quiet since the agreement reached between employers and employes shortly after the first of the year. The Steneotype Co., Indianapolis, is equipping its plant at Moores Hill, Ind., for the manufacture of fuses. The Computing & Recording Machine Co., Dayton, O., has purchased 1,000,000 pounds of brass ingots from the Progressive Metal & Refining Co., Milwaukee, to be used in the manufacture of war munitions. The R. K. Le Blond Machine Tool Co. will add another building to the two already under construction, making the total floor area 203,000 square feet. The buildings will be 70 x 300 feet, 250 x 500 feet and 50 x 570 feet.

Among New England Factories

PORTLAND, ME.—T. A. Huston will build a concrete fireproof, 4-story, 106 x 182-foot building to cost $100,000 on Forest street.

PORTLAND, ME. — The Mojonnier Bros. Co. has been incorporated to build machines, devices, etc.; $25,000 capital stock; by T. L. Croteau, A. B. Farnham and Albert F. Jones.

PORTLAND, ME.—The Cumberland County Power & Light Co. contemplates erecting a dam and power house in Hiram Falls, Cornish, to develop 20,000 horsepower, at a cost of $500,000.

RUMFORD, ME.—The Maine Coated Paper Co. will build a $200,000 addition to its plant.

HOOSICK FALLS, VT.—The Superior Mfg. Co. will build a brick, 4-story, 50 x 55-foot addition to its knitting mill to cost $30,000.

ADAMS, MASS.—Commercial Garage will build a brick, concrete and steel, 1-story, 86 x 126-foot garage on Commercial street, to cost $40,000.

BONDSVILLE, MASS.—The J. W. Bishop Co., Worcester, has been awarded a contract to build a brick, mill construction, 5-story and basement, 132 x 325-foot mill to cost $300,000 for the Boston Duck Co.

BOSTON.—The Carolina Gas & Electric Co. has been incorporated; $50,000 capital stock; by Merrill Griswold, Edward Hutchins, and J. C. Rice.

BOSTON. — The Wonder Pipe Bending Machine Co. has been incorporated; $50,000 capital stock; by Ernest G. Broiks, Arthur C. Putnam and Stanley V. Putnam.

BOSTON.—The Universal Export & Import Co. has been incorporated to deal in machinery; $25,000 capital stock; by Samuel S. Brill, Boston, Henry H. Knapp, Worcester, and Alexander S. Lewis, Worcester, Mr. Knapp was formerly assistant treasurer of the Reed-Prentice Co., Worcester.

BOSTON.—The Falls Clutch & Machinery Co. has been incorporated; $10,000 capital stock; by Theophilus King, Delceevare King and Lillian F. Parks.

BOSTON.—The Demers Motor Specialties Co. has been incorporated; $50,000 capital stock; by Louis C. Demers, Josiah S. Peshon and William G. Burns.

BOSTON.—The General Recorder Co. has been incorporated as manufacturer; $200,000 capital stock; by M. Earl Brackett, Carroll E. Richards and Victoria H. Mayr.

BOSTON. — The United Drug Co. has awarded contract for two brick, mill construction, 6-story and basement buildings on Bryant street, Roxbury, to cost $300,000 each.

BOSTON.—Benjamin Ludwig has awarded a contract for a reinforced concrete, 3-story and basement, 60 x 79-foot garage to cost $100,000 at Commercial street and Greenough lane.

BOSTON.—The George Crow Auto Co. will build a brick, concrete and terra cotta, 2-story and basement, 90 x 193-foot garage on Commonwealth avenue, Allston, to cost $25,000.

BOSTON.—The J. M. & C. J. Buckley Co. has been awarded a contract to build a brick, mill construction, 6-story and basement, 70 x 100-foot, general storage warehouse at 34 Pittsburgh street, South Boston, for the Boston Wharf Co., for $76,400.

BRAINTREE, MASS.—The Smith Chemical Specialties Co. has been incorporated; $25,000 capital stock; by Alfred A. Smith, William N. Stoddard and Bradford W. Drake.

CAMBRIDGE, MASS. — The Massachusetts Rubber Co. has awarded a contract for a 2-story, 65 x 150-foot addition to its plant to cost $35,000.

DALTON, MASS.—A contract has been awarded for a brick, 4-story addition to the mill of the Bay State Paper mill owned by Zenas and W. M. Crane.

EASTHAMPTON, MASS. — The Hampton Co. has awarded a contract for a brick, 2-story, 130 x180-foot storehouse and a cement bleach house.

FALL RIVER, MASS.—The Davis mills will build a 1-story, 77 x 156-foot addition to its No. 1 mill.

FITCHBURG, MASS.—George A. Whitney will build a concrete, brick and steel, fireproof, 86 x 209-foot picture theater on Main street to cost $50,000.

FITCHBURG, MASS. — Iver Johnson's Arms & Cycle Works has been incorporated to succeed a partnership of the same name; $600,000 capital stock; by John L. Johnson, Walter O. Johnson and Mrs. Mary L. Otto.

GARDENER, MASS.—The Heywood Bros. & Wakefield Co. is taking bids on the construction of a large addition to its plant.

HOLYOKE, MASS.—The Holyoke Valve & Hydrant Co. has awarded a contract to the Casper Ranger Construction Co. for a brick, mill construction, 4-story and basement, 100 x 234-foot factory building on Race street to cost $120,000.

NEWTON, MASS.—The Simplex Mfg. Co. has been incorporated to build electric tools; $5,000 capital stock; by William H. DeMelle, Allen F. Carver, and George R. Toney.

NORTH ANDOVER, MASS.—The Stevens mill has awarded a contract for a brick, fireproof, 4-story addition to cost $100,000.

SOMERVILLE, MASS.—The F. H. Newton Co., Boston, will build a brick, 1-story

Crawford Ore from the Dean-Itasca Mine on the Mesabi Range

The ore is non-bessemer, of good coarse structure. Dean-Itasca mine shipments for 1915 were 486,374 tons, mostly since August 1. For 1916 they will be considerably greater.

A complete analysis of Crawford Ore from Dean-Itasca Mine in natural state and dried at 212° Fahr.

	Dried 212°	Natural
Iron	58.35	50.2451
Phosphorus	.065	.05597
Silica	6.03	5.1924
Manganese	1.00	.8611
Alumina	3.40	2.9277
Lime	.16	.1377
Magnesia	.12	.1033
Sulphur	.031	.0266
Volatile Matter	5.74	4.9427
Moisture	13.89	

Crawford Ore Guarantee for 1916, 51.50 Per Cent Iron, Natural

The output of this mine during 1916, together with our five other mines, gives us an unusually large tonnage.

We are now taking contracts for this ore and will be glad to figure on your requirements for the coming season.

THE TOD-STAMBAUGH COMPANY

Perry-Payne Building

CLEVELAND :: :: :: :: OHIO

100 x 395-foot warehouse to cost $60,000, on Elmwood street.

SPENCER, MASS.—The Northern Brass Co. has begun operations at its new plant on west Main street. The company's machine shops, however, will not be ready for business until later in the year.

SPRINGFIELD, MASS. — The Springfield Vault & Construction Co. has been incorporated; $15,000 capital stock; by Alexander C. Birnie, Harry A. Bowker and Thomas J. O'Connor.

TAUNTON, MASS. — The New England Brass Co., has been incorporated; $125,000 capital stock; by William M. Lovering, Frederick H. Gooch, and F. D. Williams, Nathan Newbury, Hamilton C. Carpenter and J. L. Potter, Fall River, Mass., directors. The company will erect a 60 x 125-foot rolling mill and a 50 x 60-foot casting shop on Park street.

WHITINSVILLE, MASS.—The Whitin Machine works will build a brick, 3-story, 121 x 150-foot addition to its freight house to cost $20,000.

WILLIMANSETT, MASS. — L. D. Van Valkenburg, Holyoke, Mass., will build a brick and wood, 2-story and basement, 42 x 120-foot factory on Montgomery street and remove to Willimansett upon its completion.

WORCESTER, MASS. — The Reed & Prince Mfg. Co. will build a brick, 1-story 56 x 90-foot addition to one of its buildings.

WORCESTER, MASS.—The Morgan Construction Co. has bought 7,523 square feet of land adjoining its plant for development and future expansion.

WORCESTER, MASS. — The American Steel & Wire Co. will build a brick, 2-story, 24 x 40-foot addition to its power plant at the north works on Grove street.

WORCESTER, MASS.—The C. C. Coghlin-Wilson Electric Co. has dropped the initials C. C. from its corporate name and increased its capital stock from $2,500 to $6,000.

WORCESTER, MASS. — The Wyman-Gordon Co. will start work this spring on its proposed brick office building on Madison street, plans for which are about ready for figuring.

WORCESTER, MASS.—The United States Envelope Co., announces the purchase of the Independent Envelope Co., Indianapolis, Ind., incorporated in 1912 with a capital stock of $400,000 and which has been in the hands of a receiver since early last year. It will be operated as a division of the Cincinnati branch.

BARRINGTON, R. I.—The plant of the Barrington Steam Brick Co., which recently was damaged by fire will be rebuilt.

PROVIDENCE, R. I.—Plans are being drawn for a brick and steel, fireproof addition to the plant of the American & British Mfg. Co., Charles street.

PROVIDENCE, R. I.—Plans are being figured for a brick, 3-story factory building to be known as No. 3 mill, as an addition to the plant of the D. & W. Fuse Co.

PROVIDENCE, R. I. — William Williams has been awarded a contract for a brick, reinforced concrete and steel, fireproof, 2-story, 149 x 121-foot and 82 x 135-foot theater to cost $250,000 for the Emery Amusement Corporation, at Washington, Empire and Aborn streets.

BRIDGEPORT, CONN.—The Bridgeport Metal Goods Co. will build a brick, 4-story, 60 x 157-foot factory at Pine and Cherry streets.

BRIDGEPORT, CONN.—The Bridgeport Gas Fixture Co. has been incorporated; $25,000 capital stock; by R. T. Rock, Alice K. Rock and Thomas J. Condon.

BRIDGEPORT, CONN.—The R. T. Rock Co. has been incorporated to do a sheet metal business; $5,000 capital stock; by R. T. Rock, Alice K. Rock and John Boyhan.

BRIDGEPORT, CONN.—The T. J. Pardy Construction Co. has been awarded a contract for a concrete, fireproof 3 and 4-story, 80 x 170-foot warehouse on Congress street, for the W. M. Terry Co.

BRIDGEPORT, CONN. — Walter B. Lashar, president and treasurer of the Weed Chain Tire Grip Co., has sold its land and buildings on Connecticut avenue to the American Chain Co.

BRIDGEPORT, CONN.—The Turner Construction Co. has been awarded a contract to build a concrete and brick, fireproof, 5-story, 44 x 110-foot factory addition for the Bullard Machine Tool Co., on Railroad avenue.

BRIDGEPORT, CONN.—The T. J. Pardy Construction Co. has been awarded the contract to build a concrete, 2-story, 150 x 100-foot addition to cost $15,000 to the plant of the Bridgeport Screw Co., at Williston street and Union avenue.

BRIDGEPORT, CONN. — The Remington Arms-Union Metallic Cartridge Co. has awarded a contract to the James Stewart Co., New York, to erect 12 2-story frame dwellings, 299 brick residences, 12 1-story frame residences and 25 wooden bungalows at Remington city.

DANBURY, CONN.—The Ball & Roller Bearing Co. has increased its capital stock from $100,000 to $1,000,000.

HARTFORD, CONN. — The Kellogg & Bulkeley Co. will build a brick, 1-story, 77 x 142-foot factory on Franklin avenue.

HARTFORD, CONN. — Gordon Bros. will build a brick and stone, mill construction, 3-story and basement, 50 x 206-foot cold storage warehouse on Church street.

HARTFORD, CONN.—The Noble & Westbrook Mfg. Co. has bought a parcel of land on Tolland street, East Hartford, and is having plans prepared for another addition to its plant.

MECHANICSVILLE, CONN. — Mahoney & Coffee, Providence, R. I., have been awarded a contract for a brick power plant for the Putnam Light & Power Co.

MIDDLETOWN, CONN. — The Standard Enameling Co., recently incorporated, has decided not to go ahead with the enterprise. The officers of the company are: J. E. Neiderhauser, Simon Reiser and P. J. McDonald, general foreman. Mr. Riser and Mr. McDonald have returned to the New England Enameling Co., Portland, Conn.

MILFORD, CONN.—The Fabyan Construction Co. has been incorporated; $25,000 capital stock; by Teresina F. Dominico, Alphonso Dominico and Enirco Vito.

NEW HAVEN, CONN.—The English & Mersick Lamp & Foundry Co., formerly known as the Stevens & Sackett Co., has filed a preliminary certificate of dissolution.

NEW HAVEN, CONN. — The Majestic Laundry Co., will build a brick, mill construction, 2-story, 80 x 90-foot laundry building, a brick, 1-story and basement, 36 x 40-foot power house and a 92-foot stack, at Ashmun and Lock streets.

NORWICH, CONN.—The Carpenter Mfg. Co. has begun work on the erection of a 2-story and basement, 45 x 55-foot factory addition.

THOMASTON, CONN. — The H. Wales Lines Construction Co. has been awarded a contract to build a brick and steel, 75 x 190-foot addition to the plant of the Plume & Atwood Mfg. Co., to be used as a casting shop and storage.

THOMPSONVILLE, CONN.—The Bigelow-Hartford Carpet Co. is considering building a 6-story mill, 400 feet long.

THOMPSONVILLE, CONN.—The Northern Connecticut Light & Power Co., will build a cement, 2-story addition to its power station and office building on Central street.

WATERBURY, CONN.—A. H. Wells & Co., makers of small tubing, have purchased property on Watertown avenue and will build a 300 x 500-foot factory.

Midland Valley Railroad Makes Public Its Requirements

The following list, comprising 29 machines, is an example of the effort which carriers are making to care for the increased demand upon their resources. All inquiries should be addressed to the Company, Muskogee, Okla.

One 3½-inch twist drill grinder;
one tool grinder;
one 36-inch heavy duty drill;
one 24-inch heavy duty drill;
one 4-inch pipe machine;
one large shaper, 28 to 32 inches;
one wet tool grinder;
one 48-inch boring mill;
one dry grinder, motor-driven;
one 4-foot radial drill;
one 6-foot radial drill;
one valve seat planer;
one grindstone;
one 24-inch lathe;
one 16-inch portable lathe;
one double-head axle lathe;
one hack saw;
one link grinder;
one 36-inch planer;
one 48-inch planer;
one 16-inch tool room lathe;
one 2-inch forging machine;
one portable valve seat planer;
one large turret lathe;
one hydraulic wheel press;
one 2-inch double-head bolt cutter;
one 36-inch lathe;
one large air compressor, and
one 400-pound power hammer.

Annealing Box Talks With

ROLLING MILL JIM

Fellows, did you ever stop to think what makes an Annealing Box belly out like a cow that doesn't believe in race suicide. You know when a box is in the fire it gets as hot as the furnace. If you put a cast steel strip in the furnace and just supported it at each end, it would sag down till it slipped off the supports. This is what the "Technical Sharks" call flow and that's what happens to an Annealing Box when she sags. The box they're making at Hubbard is designed to resist this flow and that's the reason she holds her shape so good. Send 'em an order and try 'em for yourselves.

So-Long—

Rolling Mill Jim.—

Hubbard Steel Foundry Co.

EAST CHICAGO, IND.

All Kinds of Iron and Steel Rolls and Steel Castings.

Along the Middle Atlantic Seaboard

LOCKPORT, N. Y.—The Covert Mfg. Co. has let a contract for the erection of a factory building to cost $70,000.

LONG ISLAND CITY, L. I., N. Y.—The Neptune Meter Co., through its subsidiary, the Liberty Arms & Fuse Co., has taken bids on 50 to 100 additional tools for manufacturing time-fuses.

NEW YORK.—The Dietz Co., 60 Laight street, has let a contract for the erection of a 5-story, 25 x 100-foot addition to its lamp factory.

NEW YORK.—The Mica Insulator Co., 68 Church street, is about to let a contract for the erection of a 4-story factory building at Schenectady, N. Y.

NEW YORK.—The Westinghouse-Church-Kerr Co., engineer, has awarded contracts for the steel for large new shops to be erected for the Chicago, Burlington & Quincy railroad at Burlington, Ia.

NIAGARA FALLS, N. Y.—W. A. Rogers has let a contract for the erection of a 3-story and basement, 80 x 200-foot factory building.

SCHENECTADY, N. Y.—The American Locomotive Co. will build a new cylinder shop in Schenectady.

SYRACUSE, N. Y.—The Onondaga Litholite Co. has plans in progress for a 1-story, 50 x 75-foot factory addition.

SYRACUSE, N. Y.—The H. H. Franklin Mfg. Co. has let a contract for the erection of an addition to its automobile plant.

SYRACUSE, N. Y.—The U. S. Hoffman Co., Temple street, plans an addition to its plant, to cost about $100,000. M. E. Granger, architect.

SYRACUSE, N. Y.—Smith & Caffrey plan to build a foundry, to cost about $25,000. W. B. Smith, 621 North Salina street, is in charge.

BLOOMFIELD, N. J. — The Westinghouse Lamp Co. will build a storage warehouse to cost $140,000 and another addition to cost $99,000.

BLOOMFIELD, N. J.—The Thomas Oakes Co. has prepared plans for a brick and steel building 200 x 50 feet to cost $15,000. The company is also buying machinery.

ELIZABETH, N. J. — The Samuel L. Moore & Sons Corporation has let a contract with Levering & Gerrigues for a plate and angle shop on Front street. The building will cost $70,000. The other buildings are under construction.

HAINESPORT, N. J.—The car barns and repair shops of the Burlington County Transit Co. were recently damaged by fire.

HIGHTSTOWN, N. J.—The Hightstown Gas Co. has been incorporated to manufacture gas; $5,000 capital stock; by S. H. Rosebury; Hammonton; W. H. Cunningham, J. M. Vandenberg, Hightstown.

NEWARK, N. J.—Heller & Merz Co. will erect a 1-story addition to its plant 70 x 200 to cost $15,000.

NEWARK, N. J.—The International Oxygen Co. has been granted a permit to erect an addition.

NEWARK, N. J.—Announcement has been made by President William G. Besler of the Central Railroad of New Jersey, that a station to cost $1,250,000, will replace the present structure in Newark. The plans are in charge of Chief Engineer J. O. Osgood.

NEWARK, N. J.—The Hubers Becker Garage & Machine Co. has been granted a permit for erecting a 2-story building at 211 Sussex avenue.

NEWARK, N. J.—The Duratex Co. will erect a 1-story manufacturing plant 72 x 257 and a boiler house 40 x 50. The architects are Willard Case & Co., New York.

NEWARK, N. J.—Biddelman Stove Co. has been incorporated to manufacture stoves; $125,000 capital stock; by Max Biddelman, Joseph E. Cohn, Michael Silver, Newark.

NEWARK, N. J.—Iron Bound Dyestuffs Co. has been incorporated to manufacture chemicals and dyestuffs; $125,000 capital stock; by George H. Wyckoff, Moutnain Lakes, John Q. Frey, Newark; James L. Garabrant, Orange.

NEWARK, N. J.—The Doehler Die Casting Co. has been incorporated to manufacture die castings; $10,000 capital stock; by A. Berton Reed, Bertha Strauss, Brooklyn; John A. Schultz Jr., Newark.

NEW BRUNSWICK, N. J.—The city of New Brunswick has purchased land on Bayard street and will shortly issue bonds for the erection of a city hall.

Help!

Yourself to the following tips. Increased business may be yours for the asking. Atchison, Topeka & Santa Fe railroad, Topeka, Kas., is in the market for:—

Two Diamond No. 2, or equivalent, motor-driven tool grinders; one Diamond No. 2, or equivalent, belt-driven tool grinder; one 600-pound steam hammer, and one 800-pound steam hammer.

NEW BRUNSWICK.—Plans and specifications have been approved for the filtration plant. The plant will have a capacity of 6,000,000 gallons a day. The works will cost $100,000. Mayor Farrington will soon advertise for bids.

PERTH AMBOY, N. J.—The Standard Underground Cable Works has begun work on the erection of an addition at Mechanic street and De Kalb avenue.

PHILLIPSBURG, N. J. — The Warren Foundry & Machine Co. has let contracts for the steel for an extension to its plant.

RAHWAY, N. J.—The Merck Chemical Co. has let a contract for two large additions. The company will later erect dwellings for its employes.

ROSELLE PARK, N. J.—The Elizabeth Sash, Door & Supply Co. will erect four 2-story buildings to its new plant here.

TRENTON, N. J.—The Lenox, Incorporated, has let a contract for a 1-story iron and brick addition, to cost $6,500.

VERNON, N. J.—The Bethlehem Steel Co. is purchasing land at Vernon. For what purpose has not been announced.

CORAOPOLIS, PA. — The Consolidated Lamp & Glass Co. plans to erect a 2-story, 60 x 80-foot and 40 x 60-foot addition to its factory, to cost about $15,000. E. Cornelius, architect, House building, Pittsburgh.

EASTON, PA. — The Ingersoll-Rand Co shortly will let contracts for the erection of a plant extension at Easton.

ELLWOOD CITY, PA. — The directors of the Ellwood City hospital have awarded Carlisle & Sharrer, Pittsburgh, a contract for the erection of a 3-story, 36 x 60-foot building, to cost $15,000.

JOHNSTOWN, PA.—The city of Johnstown, the Johnstown Traction Co., the Pennsylvania railroad and the Cambria Steel Co. have cooperated in the construction of a 1,000-foot span overhead concrete bridge to take the place of the Franklin and Woodvale bridge, which collapsed recently. The cost is estimated at about $200,000.

NEW CASTLE, PA.—The Pennsylvania Engineering Co. plans to erect a 100 x 180-foot addition to its plant. E. W. Beadle is general manager of the company.

NEW CASTLE, PA.—County commissioners will build a bridge and viaduct over Beaver river from Montgomery avenue to the foot of Pitzer hill.

NEW CASTLE, PA. — The Davis Auto Signal Co. has been incorporated to manufacture auto appliances; $20,000 capital stock; by Sol. S. Davis, Fred Conzette and Thomas W. Dickey.

NEW CASTLE, PA. — The Mahoning & Shenango Railway & Light Co. plans to erect a sub-station to take care of all the electrical requirements of the New Castle district, to cost about $150,000.

NEW KENSINGTON.—The Aluminum Co. of America contemplates the erection of 2-story, 75 x 200-foot club house at New Kensington, to cost $200,000. Janssen & Abbott Pittsburgh, architects, are preparing plans.

PHILADELPHIA.—Gorgas Piere Mfg. Co., 26 East Allen street, will erect a 3-story, 28 x 60-foot oil-mill addition.

PITTSBURGH.—The Boyd, Boyd & Boyd Trunk Co., 34 Isabella street, plans to build a factory and warehouse.

PITTSBURGH.—The Indepedent Packing Co. plans to erect a cold-storage plant on Enterprise street, to cost about $60,000.

PITTSBURGH.—The Bohemia Brewing Co. plans to erect a 3-story addition to its plant. Plans are being prepared by Charles J. Reiger, architect, Germania Bank building.

PITTSBURGH, PA.—The United States engineer's office, Pittsburgh, will receive bids until noon, April 26, for furnishing and erecting steel lock gates and furnishing valves and lock operating machinery for inner lock at lock No. 4, Monongahela river.

PITTSBURGH. — The Atlas Welding & Supply Co. has been incorporated to repair burners, tools, machinery, welding, brazing, cutting metal, castings and machinery; $10,000 capital stock; by Frederick J. Kettling, 707 Greenfield avenue; Joseph Gehring, 523 Lowell street; Frank C. Rugh, 6555 Shetland avenue, and Charles B. Gehring, 523 Lowell street, all of Pittsburgh. The main office will be located at 2830 Penn avenue.

ST. MARY'S, PA.—The Elk Fire Co. will build an addition to cost approximately $20,000.

TYRONE, PA.—The Wilson Chemical Co. will rebuild a 3-story, 100 x 100-foot chemical plant, recently damaged by fire.

UNIONTOWN, PA. — The tipple and fan house of the Prospect Coal & Coke Co. at Dearth, near Uniontown, was recently damaged by fire.

Activities in the Central States

CINCINNATI.—The Champion Tool Co. is contemplating building a plant in Brighton, a suburb. A site of 12 acres has been purchased, but plans have not been definitely announced.

CINCINNATI. — A bond issue of $400,000 will be voted upon at a special election in the near future, to be used for the purchase of pumps, hydrants, etc., required to complete the proposed, high-pressure water system in this city.

CINCINNATI.—The contract for furnishing high pressure mains for the city of Cincinnati has been awarded to the United States Cast Iron Pipe & Foundry Co., on its bid of $52,000. Valves to be used in this work will be furnished by the Kennedy Valve Mfg. Co., Elmira, N. Y., at a cost of $2,110.

CINCINNATI.—The R. K. LeBlond Machine Tool Co. has decided to add another building to its plant now being erected in Hyde Park. The new addition will be 50 x 570 feet, and will contain 28,500 square feet. It will be used as an erecting shop. The new plant when completed will have a total of 203,000 square feet, and will consist of three buildings of the following dimensions: 70 x 300 feet, 250 x 500 feet, and 50 x 570 feet.

COLUMBUS, O.—The Phelps Mfg. Co. has been incorporated to manufacture steel wheels; capital stock, $100,000; by H. C. Phelps, George R. Hedges, Hugh Huntington, Herman R. Tingley and Stewart A. Hoover.

DAYTON, O. — The Dayton Steel Heat Treating Co. has been incorporated; capital stock, $5,000; by W. H. Hewitt, Harry E. Dubbs, Arnold P. Koors, L. Hewitt and John Whitman.

GALION, O. — The Perfection Road Machinery Co. has reduced its capital stock from $30,000 to $6,000.

CAMERON, W. VA.—The city has voted on $30,000 bonds to improve its waterworks system.

CAMERON, W. VA.—The Baltimore & Ohio railroad contemplates the erection of a waterworks plant to supply locomotives. F. L. Stuart, Baltimore, is chief engineer.

FAIRMONT, W. VA.—The house of representatives has passed a bill presented by Representative M. M. Neely of West Virginia, for the construction of a bridge across the Monongahela river.

COLUMBUS, IND.—The Columbus, Greensburg & Richmond Traction Co., John S. Shafer, 1946 Park avenue, Indianapolis, engineer, will build an 84-mile line from Columbus to Richmond, at a cost of about $3,000,000.

ELKHART, IND.—The Valley Traction Co. will build a 9-mile interurban line. H. E. Bucklin is president.

FORT WAYNE, IND.—The Nelson-Myers Iron Tie Co. is considering establishing a plant at Goshen, Va.

INDIANAPOLIS.—The Indianapolis & Cincinnati Traction Co., Charles L. Henry, president, Indianapolis, is planning to build a line from Rushville to Cincinnati, 62 miles.

INDIANAPOLIS, IND.—The Stereotype Co. has closed a contract for a large quantity of fuses to be used in its Moores Hill, Ind., plant, which it is equipping to manufacture time fuses and other specialties.

ATTICA, IND.—The National Car Coupler Co. advises *The Iron Trade Review* that the additions which are being erected to its cleaning and shipping department at a cost of $75,000 are being put up at Attica, Ind., and not as Veedersburg, as recently stated by *The Iron Trade Review*. The National Car Coupler Co. announces that these additions are steel and brick, 140 x 300 feet and will be equipped with machinery to the extent of $25,000. A brick and steel, 140 x 200-foot foundry addition will be erected the first of next year. R. J. Harrison is secretary and works manager of the company.

CHICAGO.—F. V. Wolcott, 1958 Montrose avenue, will build a 1-story machine shop to cost $8,000.

CHICAGO. — A. Finkl & Son, 1322 Courtland street, will build a 1-story machine shop, 25 x 110 feet, to cost $4,000.

CHICAGO. — F. W. Gehrer, Lincoln and North avenue, will build a 2-story factory for the manufacture of metal specialties, at a cost of $7,000.

CHICAGO.—The Imperial Pump & Tool Co. has been incorporated; $20,000 capital stock; by J. Ross Melvin, W. O. Hopkins Jr. and R. L. Otwell, 8 South Dearborn street.

CHICAGO.—The Goddard Tool Co., 351 West Chicago avenue, has been incorporated; $5,000 capital stock; by Karl B. Goddard, Frederick A. Behr and Frank S. Simmons.

CHICAGO. — The Railway Contracting & Equipment Co., 20 West Jackson boulevard, has taken a contract for constructing the Wisconsin & Illinois railroad, 115 miles, from Stockton, Ill., to Mt. Hope, Wis.

JOLIET, ILL.—The Chicago & Alton and Santa Fe railroads have been ordered by the state utilities commission to eliminate two grade crossings by bridges and subways.

MOLINE, ILL.—The Moline Tool Co. has let contracts for a 1-story factory 150 x 241 feet, to P. H. Lorenz of Moline.

PEORIA, ILL.—The Illinois Traction Co., H. J. Vance, Peoria, purchasing agent, is considering building a line from Champaign to Bloomington, 50 miles.

DETROIT. — The Chicago Pneumatic Tool Co. will build a factory at Second and Amsterdam avenues.

DETROIT. — The Stewart-Warner Speedmeter Co., Chicago, will build a factory on Woodward avenue.

LUDINGTON, MICH.—The Gile Tractor & Engine Co., W. L. Gile, manager, will build an addition to its factory, 30 x 60 feet, to cost $5,000.

MARQUETTE, MICH.—The city of Marquette will spend $50,000 to improve its electric light and power plant on Dead river. M. H. Wright is the engineer.

BELOIT, WIS. — The Gardner Machine Co., disk grinders, Beloit, has awarded a general contract to the Newton Engineering Co., 185 Mason street, Milwaukee, for the erection of a machine shop, 100 x 100 feet, and a power house, 40 x 60 feet.

BELOIT, WIS.—The P. B. Yates Machine Co., Beloit, has awarded a general contract for the erection of an addition to its machine shop of John Schneiberg, Beloit. The building will be of brick and steel, 283 x 265 feet, with sawtooth roof. The company is buying considerable crane and tool equipment. It is a large manufacturer of woodworking machinery and sawmill equipment. The name was changed recently, as noted, from the Berlin Machine Works to the P. B. Yates Machine Co. A branch plant is operated at Hamilton, Ont. L. D. Forbes is secretary of the company.

DENMARK, WIS.—Plans have been prepared by W. G. Kirchoffer, engineer, Madison, for a waterworks system, including an air lift or centrifugal pump, a 50,000-gallon steel tank on a 90-foot tower and other equipment.

DEPERE, WIS.—The Western Steel & Iron Co., DePere, Wis., has moved into its 2-story and basement shop addition, 60 x 106 feet.

DEPERE, WIS.—C. A. Lawton, president, C. A. Lawton Co., founder and machinist, has been awarded a contract for 700 pulleys, ranging in diameter from 30 to 90 inches, for immediate delivery. The Lawton force has been increased and the shop is working 13 hours a day to fill the order. The name of the purchaser is not divulged.

DEPERE, WIS. — The DePere Electric Light & Power Co., a subsidiary of the Dousman Milling Co., DePere, is about to award contracts for rebuilding its system from direct to alternating current. The cost of the improvement will be about $18,000 and the work is planned by H. A. Smith, consulting engineer, Madison, Wis. L. L. Tessler is superintendent of the plant.

GREEN BAY, WIS.—The Brown county highway commissioner has awarded a contract for a 100-foot span, with 50-foot Scherzer rolling lift, over Duck creek, near Green Bay, to the Wausau Iron Works, Wausau, Wis.

GREEN BAY, WIS.—The C. Reiss Coal Co., Sheboygan, has sold the two freighters Brazil and America, now at Green Bay, to Boland & Cornelius, Buffalo. The vessels have been operated by the North American Steamship Co. in the ore and coal trade on the Great Lakes for several years.

GREEN BAY, WIS.—It is reported that the architectural department of the Chicago, & Northwestern railroad is preparing plans for the new car shops at Green Bay, Wis., projected several years ago and postponed. The building will be 80 x 200 feet, two stories, of brick and steel construction, with mill floors. W. H. Finley, 226 West Jackson boulevard, Chicago, is the chief engineer.

KIEL, WIS.—The Kiel Woodenware Co., Kiel, Manitowoc county, has increased its capital stock from $100,000 to $200,000. Officials intimate that plant extensions are under consideration.

MADISON, WIS. — The C. F. Burgess Laboratories has filed notice of amendment to its corporate articles to provide for an increase in the capital stock from $40,000 to $100,000, and an increase in the number of directors from three to five. The business will be extended and the laboratories enlarged.

MADISON, WIS.—Bids will be received in May for a waterworks plant including an 8,000,000-gallon high service pumping engine and two 200-horsepower boilers. L. A. Smith is the superintendent of waterworks.

MARINETTE, WIS.—The Vacuum Machinery Co., Marinette, has been organized with a capital stock of $25,000 by Ralph Skidmore, A. C. Hawkins and L. M. Skinner and will establish a plant at once.

MILWAUKEE.—The Northwestern Bridge & Iron Co., Milwaukee, was awarded a contract for the structural steel on the new plant of the Claus Automatic Gas Cock Co., on Booth street, near Townsend street, Milwaukee. It will require about 200 tons.

MILWAUKEE.—Newton Engineering Co., 185 Mason street, has been awarded a general contract for the erection of a $25,000 garage at 527 Jefferson street. The owner's name is withheld. The building will be 50 x

125 feet, of reinforced concrete and with steel-trussed roof.

MILWAUKEE.—The Badger Auto Body Co., the incorporation of which has been previously noted, has leased a 2-story factory building at Lisbon avenue and the Milwaukee road tracks and will remodel it for the manufacture of special automobile bodies in metal and frame.

MILWAUKEE.—The Pawling & Harnischfeger Co., crane manufacturer, Thirty-eighth and National avenues, Milwaukee, which recently completed work on an addition to its pattern shop and vaults, is taking bids on the erection of a blacksmithing shop, 80 x 96 feet, brick and steel. Kirchoff & Rose, Majestic building, prepared the plans.

MILWAUKEE.—A $350,000 sawmill will be built in Wilkinson county, Miss., during the summer by the Foster Creek Lumber & Mfg. Co., which has just been incorporated at Madison, Wis., with a capital stock of $1,500,000. George L. Stephenson, Milwaukee, is secretary and general manager and will direct the construction and equipment of the mill, which will be a double band, with resaw. The company expects to cut 30,000,000 feet annually from a tract of 52,000 acres.

MILWAUKEE.—The Wallman Mfg. Co., oil tanks, pumps, storage systems, etc., 283 Fifth avenue, Milwaukee, has been taken over by interests represented by Clement W. and Charles Inglis, and the corporate name has been changed to The Inglis Mfg. Co. The president and treasurer is C. W. Inglis, who is secretary of the Milwaukee Steel Foundry Co. It is the intention of the company to increase the production, especially of storage systems for garages and industrial concerns.

OSHKOSH, WIS.—A plant will be erected for the Oshkosh Mirror Works, 42 Cape street, on a site, 110 x 230 feet, on Broad street, Oshkosh. Plans are now being prepared for a fireproof building, to be erected by Edward H. Smith for the company.

OSHKOSH, WIS.—Articles of incorporation have been filed by the Universal Foundry Co., Oshkosh. The capital stock is $10,000 and the incorporators are J. D. Termaat, L. J. Monahan and A. C. Ziebell. The incorporators have been affiliated with the Termatt & Monahan Co., Oshkosh, builder of gasoline engines and motors.

OSHKOSH, WIS.—Leading business and professional men of Oshkosh have organized the Oshkosh Industrial Promotion Co., with a capital stock of $100,000, to put under way a concerted effort to induce outside industrial concerns to relocate their plants in Oshkosh, as well as to promote the welfare of the manufacturers already established in that city. The incorporators are R. C. Brown, H. I. Weed, Burton Clark and William Wallen.

Look!

Over the needs of the Inland Steel Co. for installation in its works at Indiana Harbor, Ind.

Two 20-inch heavy duty lathes;
two 24-inch heavy duty lathes;
one 24-inch upright drill press;
one 12-inch high speed drill press;
two 24-inch shapers;
one 30-inch shaper;
one 42 x 42-inch heavy duty planer with 12-inch tables;
two 4 x 24 double emery wheel stands;
one 24 x 2¼-inch flat turret lathe;
one 24 x 8¼-inch flat turret lathe;
two 4-foot radial heavy duty drills, and
one 6-foot full universal heavy duty drill

RACINE, WIS.—The Milwaukee Light, Heat & Traction Co. has purchased the 3-story factory building of the Common Sense Trunk Co. and will wreck it to provide a site for a boiler house, to contain two 500-horsepower boilers.

SHEBOYGAN, WIS.—Peter Reiss is taking bids for the erection of a $25,000 factory and power plant to be occupied by the J. C. Nichols Harness Co., Janesville, Wis., which will move its works to Sheboygan upon completion of the buildings. Individual electric motor drive will be employed throughout and the factory, protected by a sprinkler system, will be of brick and mill construction.

WADENA, WIS.—Bonds for $11,000 have been voted for extensions to the waterworks and electric light plant, including alternator and engine or 60-cycle, 3-phase, 2,300-volt, 100 to 200-kilowatt turbine.

WAUKESHA, WIS.—The R. L. Kenyon Co., Waukesha, Wis., builder of portable houses and buildings and camping goods, has increased its capital stock from $100,000 to $200,000 and will enlarge its facilities, adding a considerable list of wood and textile working machinery.

WAUSAU, WIS.—An expenditure of $50,000 has been authorized by the Wisconsin Valley Electric Co. for extensive improvements in the electric line of the city of Wausau.

ST. LOUIS.—The Wagner Electric Mfg. Co. is building two additional structures, one 90 x 140 feet, with a traveling crane of 50-foot span, for punching press operations, the other 90 x 160 feet, equipped to manufacture small parts. The Condron Co., Chicago, is preparing plans. The company's capital recently was increased from $1,800,000 to $2,000,000, to cover these extensions.

FORT MADISON, IA.—Plans have been prepared for a bridge over the Mississippi river at Fort Madison for the Santa Fe railroad. C. W. Felt, Chicago, is the chief engineer.

EAGLE BEND, MINN.—Bids will be received until May 1, A. R. Fuller, village recorder, for a 40-foot steel truss span. Alternate bids will be taken on two 20-foot concrete spans.

MINNEAPOLIS.—The Soo railroad, C. N. Kalk, chief engineer, Minneapolis, will build a 45-mile extension from Reserve to Mellen, Wis.

ST. PAUL.—The Brown, Blodgett & Sperry Co. will take bids soon on a 3-story factory building, 100 x 150 feet, to cost $50,000.

In the South and Around the Gulf

HOYELLS, GA.—The Seaboard Air line shortly will let contracts for the erection of new shop buildings in Howells.

COLLINWOOD, TENN.—The Wayne-Hardin railroad, E. H. Steinman, president, Collinwood, is considering building a line to Savannah, Tenn., 56 miles.

KNOXVILLE, TENN. — The Akron, O., Airless Tire Co. is negotiating with local interests in regard to locating a southern branch factory in Knoxville.

KNOXVILLE, TENN.—The John J. Duncan Co., 308 W. Jackson avenue, is asking for prices on an 8 x 10 double-cylinder, double-drum hoisting engine without boiler.

NASHVILLE, TENN.—F. B. Shirley, 600 McGavock street, Nashville, is interested in a proposed railroad for the Tennessee Zinc Corporation, from La Follette to Shawnee, Tenn., 32 miles, and a branch of 12 miles.

NEW TAZEWELL, TENN. — M. B. Carrand and J. W. Rose will construct a light plant and waterworks system.

GRAYSON, KY.—J. A. Bagby, J. W. Stovall and others have incorporated the Grayson Light & Power Co., with a capital stock of $6,000.

LOUISVILLE, KY.—The White Tire Co., incorporated with $10,000 capital, plans a plant to manufacture automobile tires in Louisville, Emil VonAllmen, B. H. Plaskett and Charles Dobbs are the incorporators.

MOREHEAD, KY.—The Hall Bros. Melting Co. has been incorporated; capital stock, $7,500; by W. T. Hall, L. H. Hall, C. M. Hall and Noah Hall.

PADUCAH, KY. — Frank Spencer, Louisville, and others, of Paduach, are organizing a company to be capitalized at $50,000 and to establish a factory here for manufacturing a substitute for the building materials.

PADUCAH, KY.—The Nashville, Chattanooga & St. Louis, the Chicago, Burlington & Quincy and the Paducah & Illinois railroads will construct a union passenger and freight depots, and provide other terminal facilities in Paducah.

SHELBYVILLE, KY.—W. W. Lindsey, of Detroit, Mich., is in correspondence with J. W. Gudgell and others of Shelbyville in connection with construction of an electric railway to connect Shelbyville and Frankfort, Ky., 20 miles.

FORT SMITH, ARK. — The Burke Bros. Construction Co. has been given the contract for building the Cotter, Rush & Mineral Belt railroad, from Cotter to Rush creek, 14 miles, at about $300,000.

BARSTOW, TEX.—The Tri-State Engineering Co. is preparing plans for a waterworks system including pumping machinery, diesel engine and other equipment.

FORT WORTH, TEX.—The city commissioner will build a pumping plant on the Lake Worth conduit, costing $400,000.

GALVESTON, TEX.—The Phoenix Iron & Steel Co. has been incorporated; $100,000 capital stock; by Leonard Joseph, D. A. Singer and Walter Buchtler.

SAN ANTONIO, TEX.—The Alamo Gas Generator Co. has been incorporated; $3,000 capital stock; by G. H. Marshall, William Hanson and W. E. Little.

Western and Intermountain Territory

ARMA, KAS.—A waterworks system is to be built at a cost of $9,000, including 11,000 feet of 4-inch cast iron pipe. A. C. Moore, Joplin, Mo., is engineer. Samuel Buchanan is the city clerk.

DIGHTON, KAS.—Plans are being prepared for a waterworks and electric light plant to cost $300,000. W. B. Rollins & Co., 439 Midland building, Kansas City, Mo., are engineers.

LAWRENCE, KAS.—An election will be held soon to vote on issuing on $75,000 in bonds for a waterworks system.

OMAHA, NEB.—Railways entering Omaha are planning to erect a union station costing $2,000,000.

OMAHA, NEB.—The McCayne Investment Co., Fifteenth and Dodge streets, will build a boiler factory, 34 x 67 feet, to cost $4,000.

OMAHA, NEB.—The Commercial club is considering plans for an 8-story athletic club building, to cost $400,000, including 150 living rooms, swimming pool, and gymnasium. G. E. Haverstick, 124 South Thirty-eighth street, is interested.

JAMESTOWN, N. D.—The Western Electric Co., Jamestown, is considering plans for a new power plant.

WAHPETON, N. D.—The Duluth, Huron & Southern railroad has been incorporated to build a line from Duluth through Wahpeton to Huron. G. W. Morrow, of Wahpeton, is vice president.

GLENDIVE, MONT.—The city of Glendive will vote May 15 on the question of issuing $65,000 in bonds to construct a modern filtration plant and replace with cast iron many of the wooden water mains.

GREAT FALLS, MONT.—Work has been started on the foundation of the smelting plant of the Anaconda Copper Mining Co., at Great Falls. This installation will cost about $2,000,000.

HELENA.—The Montana Power Co. will start construction soon on a dam and power plant at Holter, a few miles from Helena. Estimated cost is $3,000,000. Frank Scotten, engineer for the Montana Power Co., is in charge.

COLORADO SPRINGS, COLO.—The city of Colorado Springs is considering the construction of a waterworks system to cost $75,000 to $150,000. F. Mallory is the city engineer.

DENVER, COLO.—The Denver Iron Works & Foundry Co. will build a 1-story foundry, 75 x 75 feet, to cost $10,000 and a machine shop, two stories, 28 x 110 feet, to cost $10,000. Roeschlaub & Fuller, 310 Foster building, are the architects.

ALAMOGORDO, N. M.—An election will be held April 4 on issuing $150,000 in bonds for a waterworks system. John R. DeMien is recorder.

SPRINGER, N. M.—An election will be held April 4 on issuing $32,000 in bonds for a waterworks system.

CASA GRANDE, ARIZ. — The city of Casa Grande will spend $35,000 for a waterworks system, including a 10,000-gallon tank, a 15-inch turbine pump and booster. Sydney J. Mashler, Tucson, Ariz., is the engineer.

DOUGLAS, ARIZ.—The Calumet & Arizona Mining Co. will spend $1,200,000 on improvements including an acid plant with a capacity of 200 tons of sulphuric acid daily, 12 roasters, a blower engine, transmission lines, and 150 per cent increase in its electric plant.

OATMAN, ARIZ.—Bids will be received until June 15 by C. L. Mayhew, secretary of the Mohave-Oatman Water Co., for the installation of a waterworks and sewer system to cost $250,000 to $300,000.

BUHL, IDA.—The city council of Buhl is planning improvements to the waterworks system to cost $50,000, including a new pumping plant.

KELLOGG, IDA.—It is reported that the Bunker Hill & Sullivan Mining & Concentrating Co. has let a contract for a 3-furnace silver-lead smelter and that the machinery is now being built by the Taylor Engineering Mfg. Co., Allentown, Pa. The location of this plant is not announced, but it is thought it will be at Kellogg.

WALLACE, IDA.—The Ray-Jefferson Co., in accordance with announcement made several months ago, will construct a 300-ton capacity mill at the forks of Beaver and Carbon creeks. An electric train will deliver the ore from the mine to the mill.

Lost!

Opportunities never return, so we are told. Cheer up; here are seven "leads", which it will be to your advantage to follow!

Westinghouse, Church, Kerr & Co., New York City, are taking bids on two 125-ton, five 15-ton, two 10-ton and one 50-ton crane for installation in shops to be built at Burlington, Ia., for the Chicago, Burlington & Quincy railroad. This carrier is expected to be in the market shortly for a large amount of equipment for its new shops.

Levering Bros., Baltimore, are taking bids on an extensive installation of machine tools and other equipment.

Lilpop Bros., Moscow, Warsaw and Petrograd, Russia, have established a New York office at 11 Broadway, and are interested in the purchase of all kinds of engineering supplies.

The Laconia Car Co., Laconia, N. H., is taking bids on a light gate shear for use in conjunction with 3/16-inch light plates.

The Neptune Meter Co., through its subsidiary the Liberty Arms & Fuse Co., Long Island City, N. Y., is in the market for a number of machine tools for the manufacture of fuses.

The Shelby Steel Tube Co. is in the market for four electric traveling cranes for use in extensions which this company is erecting at Elkwood City, Pa.

The National Steel Casting Co., which is building a foundry at New Cumberland, W. Va., is in the market for a 15-ton and one 10-ton electric crane.

Pacific Coast and Western Canada

COVINA, CAL. — A contract will be let about May 1 for a waterworks system costing $100,000, including pumps, turbines, oil engines and gas engines. F. E. Trask, 616 Union Oil building, Los Angeles, is the consulting engineer.

LOS ANGELES, CAL.—The Cochise Machinery Co., 405 Aliso street, will build a factory at Laguna Beach.

LOS ANGELES.—The Pacific Electric railroad, J. M. Millam, general manager, will build a steel bridge of five spans, 90 feet each, over the Santa Ana river.

SAN FRANCISCO.—W. Hood, chief engineer of the Southern Pacific railroad, will start work shortly on the electrification of 40 miles of road from Whiteson to Corvallis, Oregon.

KELSO, WASH.—The county commissioners have decided to erect a 120-foot steel span bridge over the Gray river at Kelso.

ODESSA, WASH.—Bids will be received until May 1 by W. M. Nevins, city clerk, for the construction of two 50-foot concrete or steel spans over Crab creek. Guy G. Harvey, county engineer, prepared the plans.

PESCO, WASH.—It is probable that a $200,000 steel bridge will be constructed across the Snake river between Pasco and Burbank.

SEATTLE, WASH.—The Hofius Steel & Equipment Co., Seattle, George J. Danz, president, has purchased 16 acres at the head of the Duwamish waterway. No plans are contemplated for a plant, but the purchase was merely to provide for the ultimate necessities of the company.

SPOKANE, WASH.—The Constitution Mining & Milling Co. is contemplating the installation of an electric smelting plant, according to its president, George Turner.

TACOMA, WASH. — An additional converter furnace is to be added to the plant of the Tacoma smelter, according to announcement made by H. Y. Walker, manager of the plant. This addition makes six furnaces that have been installed during the past few months. The American Smelting & Refining Co. recently made an appropriation for constructing this installation.

TACOMA, WASH.—The Oregon-Washington Railroad & Navigation Co. announces that it will spend $3,650,000 during 1916 for improvements to its line. These provide for rail renewals over 112 miles at a cost of $250,000; $200,000 for steel bridges, $920,000 for completion of the Vale extension; $125,000 for passing track extensions, and $1,020,000 for miscellaneous improvements.

SILVERTON, ORE. — Orders have been given by Jacob Mortenson, Oak Park, Ill., president of the Silver Falls Timber Co., Sil-

verton, for the construction of a $400,000 sawmill to employ 300 men.

VANCOUVER. — The North Bank railroad will build a scrap reclaiming plant and buy some new equipment at a cost of $20,000.

GOVAN, SASK. — The Govan Motor & Threshing Co. has been incorporated to manufacture threshing engines, farm implements, motors, etc.; $20,000 capital stock.

REGINA, SASK.—Fire damaged the round house at Regina, with a loss of $15,000, owned by the Canadian Northern Railway Co., 1 Toronto street, Toronto.

REGINA, SASK.—The Prairie Biscuit & Confectionery Co. will build a factory at Regina, to cost $50,000. H. W. Fox of Chicago, has been appointed manager of the company.

New Business in Eastern Canada

WINNEPEG, MAN.—The Dominion Bridge Co. has been awarded a contract for the steel required for the new department store building of the Eaton Co., Ltd., which will cost about $200,000.

WINNIPEG, MAN.—The Baldwin Mfg., recently incorporated to manufacture grain threshers, farm implements, etc., $1,000,000 capital stock; will build a large plant at Winnipeg at an early date. G. L. Constable is president of the company.

BARRIE, ONT. — The Water & Light Commission will install new pumping machinery at its plant to replace that at present in use.

BERLIN, ONT.—Fire caused $5,000 damage to the plant of the Forwell Foundry Co., Berlin.

BRAMPTON, ONT. — The Acme Rubber Co., in which F. D. Law of 471 Yonge street, Toronto, is interested, will erect a plant at Brampton, Ont., to cost $30,000. Rubber tires and rubber goods will be manufactured by the company.

BRANTFORD, ONT. — The Waddell Preserving Co. will erect a factory and install machinery for the manufacture of its products. Fred W. Ryerson is president, J. A. Waddell is managing director and secretary.

COLLINGWOOD, ONT.—The chairman of the Collingwood Water & Light commission will receive sealed tenders up to April 11 for pumping machinery comprising two motor-driven units of 1,000 gallon capacity each, pump well, and connections.

ELMIRA, ONT.—The mill and machinery of the Bauman & Letson Planing Mills at Elmira, was damaged by fire with a loss of $20,000. The mill will be rebuilt as soon as possible.

GUELPH, ONT.—The Gilson Mfg. Co. has been incorporated to build gasoline engines and agricultural implements; $150,000 capital stock; by Edward Barelman and Walter C. Buckingham, of Guelph and John Gilson, of Port Washington, Wis.

HAMILTON, ONT.—The Canada Wire & Iron Goods Co., King William street, will have an addition built to its plant to cost $4,000.

HAMILTON, ONT.—Ford & Featherstone, agents for the erection of a factory for the manufacture of safes in which the Cary Safe Co. will be interested.

HAMILTON, ONT.—The Hamilton Stock Brick Supply Co. has been incorporated to manufacture building material and builders' supplies; $40,000 capital stock; provisional directors Edward New, Wm. H. Cooper, John E. Frid and others, of Hamilton.

HAMILTON, ONT.—The Stanley Steel Co., Ldt., has been incorporated to carry on the business in iron and manufacturer of steel and iron; $250,000 capital stock; by Arthur T. Hatch, Frederick M. Hatch, Thomas C. Haslett and others of Hamilton.

HAMILTON, ONT. — The Barton Feeders has been incorporated to manufacture furniture, nails, horse shoes, machinery, tools, vehicles of all kinds, etc.; $40,000 capital stock; by Hugh J. McKenna, Llewellyn F. Stephen, William J. Lord, and others all of Hamilton.

KINGSTON, ONT.—The city council of Kingston has decided to undertake municipal road paving and has authorized the purchase of an extensive plant.

LISTOWEL, ONT.—The Hydro-Electric Radiation Co. will build a plant at Listowel. The Manager is G. E. Harrison, 704 Traders Bank building, Yonge street, Toronto.

NIAGARA FALLS, ONT. — Plans have been prepared by the Perfection Tire & Motor Co., of Fort Madison, Ia., for the erection of a plant at Niagara Falls to cost about $300,000.

OWEN SOUND, ONT.—The Iron Works Co. has been incorporated to operate a foundry and machine shop and build engines, machinery, tools; $96,000 capital stock, by Francis H. Kilbourn, John McEwen, Samuel A. McDougall and others of Owen Sound.

PARRY SOUND, ONT.—The Nobel plant of the Canadian Explosives Co. was recently damaged by fire.

POINT EDWARD, ONT. — The Grand Trunk railroad will build a 1,200-foot freight shed and elevator, the latter to replace that damaged two years ago.

PORT ARTHUR, ONT.—The Conley Frog & Switch Co., Memphis, Tenn., which a few years ago undertook the establishment of a branch plant, has entered into an agreement with the city under which it will complete the plant expending $100,000 upon it, the city to give the company $25,000 bonus when it is in operation. The company is to employ at least 50 men.

FORT WILLIAM, ONT. — The pipe foundry of the Canada Iron Foundries will be opened shortly, giving employment to 200 men.

FORT WILLIAM, ONT.—The Mutual Elevator Co. has closed a contract with the Fegels Engineering & Construction Co. for the construction of the first unit of 500,000 bushels capacity of its elevator on the Kaministiquia river. It will be of steel and concrete and will cost $300,000.

LINDSAY, ONT. — The Hodgson Bros. Chemical Co. has been incorporated to build a chemical plant at Lindsay at a cost of about $60,000 to manufacture chemicals, etc.; $200,000 capital stock; by Thomas Hodgson and James I. Hartt of Orillia, Ont.; John H. Lowry, John Carew and others of Lindsay, Ont. Thomas Hodgson of Orillia, Ont., will be in charge of the construction of the plant at Lindsay.

RENFREW, ONT.—The International Molybdenum Co., capitalized at $5,000,000, will erect a smelter to operate on a large scale.

RENFREW, ONT.—The shell factory of the Renfrew Machinery Co. was seriously damaged by fire entailing a loss estimated at $100,000. The plant will be rebuilt immediately.

RENFREW, ONT.—The O'Briens Munitions Co., whose plant was recently damaged by fire, is having plans prepared by the company's architect for the rebuilding of the plant. The cost of the new plant will be $75,000.

SARNIA, ONT.—The Sarnia Creamery Co. will install a refrigerating and ice-making plant at its factory.

SARNIA, ONT.—The Sarnia Hydro-Electric commision is planning a lighting system for the water front including the frontage of the Grand Trunk and Northern Navigation Co. Ornamental lights of 1,000 candle-power are proposed for the business section.

SAULT STE. MARIE, ONT.—The Algoma Steel Corporation will build a 120 x 350-foot addition to its plant in connection with the open hearth plant being erected there.

SAULT STE. MARIE, ONT.—James Hepworth, of Chicago, has closed a deal whereby the Great Lakes Power Co., a newly organized corporation, composed of United States capitalists, will take over the power plant at the Soo; street railway system and the international ferry, from the Algoma Steel Corporation. The plans drawn up by the Great Lakes Co. provide for an immediate improvement of the power plant at Sault Ste. Marie to the extent of nearly $3,000,000. It is planned to develop 30,000 horsepower in the completed plant. Mayor McPhail is a director of the new company.

ST. CATHERINES, ONT.—The Dominion Food Co., Russell avenue, will erect a factory at St. Catharines to cost $20,000.

TORONTO, ONT. — Robertson Bros., confectioners, will build a 5-story brick addition to their factory at 103 Queen street East to cost $25,000.

TORONTO, ONT. — The city council has voted $198,000 as the city's share of the cost of a double-deck railway bridge on the Canadian Pacific railway over a ravine in the eastern section.

TORONTO, ONT.—The Hall Motors Co. has been incorporated to build automobiles, bicycles, engines and vehicles; $40,000 capital stock; by Robert H. Van Kempen, Adam B. Mitchell, Wm. M. Hall, and others of Toronto.

TORONTO, ONT.—The Scranton Lehigh Coal Co. has been incorporated to carry on a general coal mining business, lumbering business, etc.; $40,000 capital stock; by Minnie Warren, Apollos B. Kerr, Roscoe S. Rodd and others, all of Toronto.

TORONTO, ONT.—The Motor Exchange has been incorporated to manufacture automobiles, engines, motors, etc.; $40,000 capital stock; by William M. Campbell, 367 Dovercourt road, John R. O'Connor, Laura A. Bayes, and others all of Toronto.

TORONTO, ONT.—The Vanbosser Co. has been incorporated to build machinery, plants, tools, steel, etc.; $40,000 capital stock; by Joseph M. Bullen, 21 Grenadier road; Francis H. Hurley, care McMaster, Fleury & Co., 44 King street west, Harold L. Steele, and others, all of Toronto.

TORONTO, ONT.—The Consumers Heating Co. has been incorporated to construct and operate works for the production and distribution of steam and hot water in Berlin, Ont.; $100,000 capital stock; provisional di-

rectors Dixie C. Cotton, George A. Tee and Joseph Hobson, all of Toronto.

TORONTO, ONT.—The Dominion Salvage & Wrecking Co. has been incorporated to carry on a general salvage business, to manufacture brick, machinery, hardware, etc.; $25,000 capital stock; by Bruce F. Fisher, 42 St. George street; Wilson N. Robinson, Ida B. Lynn and others all of Toronto.

TORONTO, ONT.—The John Dixon & Co., a corporation created under the laws of the United Kingdom of Great Britain, has been granted a license to manufacture machine rules, hot presses, glazers, etc.; $40,000 capital stock; Reginald G. Allder, of Toronto, Ont., has been appointed attorney.

TORONTO, ONT.—The Universal Novelties has been incorporated to manufacture metal toys, machinery, etc.; $25,000 capital stock; by Thomas S. H. Giles, care Bain, Bicknell, Macdonell & Gordon, 6 Adelaide street east; Harry Riley, 7 Wineva avenue; John F. Macgregor, and others all of Toronto.

TORONTO, ONT.—The Acme Tire & Rubber Co. has been incorporated to manufacture mechanical rubber goods, tires, etc.; $400,000 capital stock; by Joseph M. Bullen, 21 Grenadier road, Francis H. Hurley, care of McMaster Fleury & Co., 44 King street west, Toronto; Harold L. Steele, 437 Broadview avenue, and others.

TORONTO, ONT.—The Commercial Motor Bodies & Carriages Co. has been incorporated to carry on a general woodworking business, to build motor cars, automobiles, engines, machinery, etc.; $40,000 capital stock; by Elizabeth Knox, Emma P. King, Harvey B. Setterington, 363 Huron street, Toronto, and others.

TORONTO, ONT.—The Empire Hippodrome Co. has been incorporated to build a hippodrome in Toronto at a cost of about $1,500,000 at the corner of College and Treaulay streets, Toronto; $1,000,000 capital stock; by H. H. Williams, King street west; Margaret C. Haynes, Mina L. Williamson, and others, all of Toronto.

TRENTON, ONT.—The Barr Registers has been incorporated to manufacture metal castings, specialties, metal goods, etc.; $300,000 capital stock; by Wilson Barr, William H. Matthews, of Trenton, Ont., Stephen F. Washington, Hamilton, Ont., and others.

WALLACEBURG, ONT.—The Wallaceburg Brick Co., Box 164, Wallaceburg, is in the market for a single cylinder, 50-horsepower, or over, stationary natural gas engine.

WELLAND, ONT.—The Volta Mfg. Co., operated by R. Turnbull and John Young, has secured a site at Welland and will build a brick and steel factory 50 x 60 feet, two stories. The company manufactures all kinds of specialties for electric furnaces.

MONTREAL, QUE.—The Machineries Co. has been incorporated to manufacture machinery, tools, iron, steel, etc.; $20,000 capital stock; by J. W. Blair, and others, all of Montreal.

QUEBEC, QUE.—The Quebec Scrap Metal & Paper Co. has been incorporated to manufacture and deal in metals, machinery, tools, etc.; $20,000 capital stock; by J. Fitch, and others of Quebec.

MONTREAL, QUE.—The Canadian Welding Works has been incorporated to manufacture iron, steel and to carry on a general foundry business; $10,000 capital stock; by L. V. Miller, and others of Montreal.

MONTREAL, QUE.—The Modern Heating & Engineering Co., Ltd., has been incorporated to carry on business as mechanical engineer, founder and contractor; $49,000 capital stock; by Joseph E. Gravelle, Joseph Caron, Joseph U. Archambault and others of Hull, Que.

MONTREAL, QUE.—The Consumers Metal Co. has been incorporated to manufacture machinery, tools, implements, iron, steel, etc., $40,000 capital stock; by Henry R. Mulvena, Thomas B. Gould, Duncan Macdonald, Laura M. Smith, and others all of Montreal.

MONTREAL, QUE. — The Foundry & Machine Co. has been incorporated to carry on a general foundry business, to manufacture machinery, tools, shells, munitions, motors, etc.; $200,000 capital stock; by John J. Tolland, Joseph U. Emard, John A. Sullivan, G. A. Normandin, and others all of Montreal.

MONTREAL, QUE. — The Acme Steel Goods Co., of Canada, has been incorporated to manufacture machinery, tools, iron, steel, brass, etc.; $3,000 capital stock; by James E. MacMurray, George C. Longman, Ralph H. Norton, all of Chicago, Jean J. Beauchamp, and others of Montreal.

MONTREAL, QUE. — The Robidoux Sand Co., Ltd., has been incorporated to manufacture sand stone, brick, builders supplies, etc.; $36,000 capital stock; by Emil Charland, Joseph Laurent, Charles A. H. Mertrand, all of Montreal; Wilfrid Robidoux, of Yamaska, Que,. and others.

MONTREAL, QUE.—Dominion Bridge Co.'s departments for the manufacture of products for domestic consumption are being greatly extended. The announcement was made this week that the company has been awarded the contract for the structural steel work on the T. Eaton Co.'s Winnipeg building. This contract is worth $200,000.

STE. GENEVIEVE DE PIERREFONDS, QUE.—The Pierrefonds Electric Co. has been incorporated to carry on the business of an electric light, heat and power company; $50,000 capital stock; by Joseph Bernard, George St. Germain, Napoleon Nantel and others, all of Montreal.

THREE RIVERS, QUE.—The Loomis, Dakin Co., St. Gabriel street, Sherbrooke, Que., has been awarded a contract for the erection of an addition to the plant of the Canada Iron Corporation.

ST. JOHN, N. B.—The Eastern Copper Co., lately incorporated with $990,000 capital stock, has taken over and will operate mining property on the north shore of the Bay of Fundy in New Brunswick. The directors of the company are Howard R. Richey, Major E. A. Maynes and Armand Moscoe, all of New York; and Charles Brandeis and E. Albert Reilly of Moncton, N. B.

SYDNEY MINES, N. S.—The Nova Scotia Steel & Coal Co. will erect an additional blast furnace to cost between $200,000 and $300,000.

TRURO, N. S.—The Eastern Trust Co. of Halifax, N. S., is asking for tenders to be received until April 15, for the plant of the Chambers Electric Light & Power Co.

New Trade Publications

AIR COMPRESSORS.—A 32-page bulletin printed in two colors recently has been issued by the Ingersoll-Rand Co., New York City, which illustrates and describes its line of duplex corliss steam-driven air compressors. These machines are made in different types with cross-compound steam and two-stage compressing cylinders with overhead intercooler, compressors with cross-compound steam and two-stage compressing cylinders and compressors with cross-compound steam and duplex single stage air cylinders. Details of the compressors are illustrated and described and tables of dimensions also are included.

PUMPS.—The Standard Pump & Engine Co., Akron, O., has issued an attractive 48-page booklet on "Standard Pumping Units for Water Supply." The equipment for hand pump, electric, and engine-driven water systems is described in detail and fully illustrated. The subject of engine design is given considerable attention, while gearing problems and the use of automatic safety valves are discussed. In addition to water supply equipment, the catalog shows installations of isolated combined water and lighting plants and storage battery electric lighting plants. Several pages of tables of weights, measures, horsepower, etc., help to make the catalog extremely useful to those interested in water pumping systems.

CRUSHING EQUIPMENT. — A 46-page catalog published by the Williams Patent Crusher & Pulverizer Co., St. Louis, describes its various types of crushing machinery in detail. The Williams company manufactures granulators, masticators, disintegrators and similar devices, which are operated upon a hinged hammer principle. Reduction is effected by a combination of abrasion and percussion. The hammers may be adjusted to the breaker plate and gage by a series of adjusting holes in the disc plates, thus keeping the diameter of the grinding cylinder the same at all times, in order to insure a uniform product. The company's crushers are equipped with alternating discs, by means of which the hammers are staggered, so as to provide a hammer point at every part of the grinding chamber. Among the equipment described in the catalog are coal crushers for coke oven use, camel-back crushers designed for a similar purpose, grinders for handling wet coal direct from the washer, debris crushers, stoker coal crushers, dust-proof and pony crushers and chain hammer crushers.

CONDENSING EQUIPMENT. — A handsome 180-page illustrated catalog of condensing equipment has been published by the C. H. Wheeler Mfg. Co., Philadelphia. The first chapter of the booklet emphasizes the importance of high vacuums in the operation of steam turbines, and is followed by a comprehensive treatise on the thermodynamics of condensers. Jet and barometric condensers are pictured and described. A feature of the jet condenser is the automatic vacuum breaker which protects the main engine or turbine from flooding in case the water removal pump should fail or too much water should be admitted. Surface condensers are described in much detail. The company manufactures condensers of this type for either the wet or wet and dry systems of vacuum operation. Auxiliary apparatus for condensing units is described. Vacuum pumps of various kinds, steam and centrifugal pumps, feed water heaters, engines, exhaust connections, cooling towers and spray systems are mentioned. Valuable engineering tables are given in the last pages of the catalog.

IRON AND STEEL PRICES

Corrected up to Tuesday noon

PIG IRON

(Lower price to July 1; higher to Jan. 1.)

Bessemer valley	$21.00 to 21.50
Bessemer, Pittsburgh	21.95 to 22.45
Basic, Pittsburgh	19.20 to 19.45
Basic, eastern Pa.	20.50 to 21.00
Basic, Buffalo	18.50 to 19.00
Malleable, Pittsburgh	19.45 to 19.95
Malleable foundry, Chicago	19.50
Malleable foundry, Philadelphia	21.50 to 21.75
Malleable foundry, Buffalo	19.00 to 20.00
No. 1X foundry, Philadelphia	20.75 to 21.25
No. 2 foundry, Pittsburgh	19.45 to 19.95
No. 2, foundry, Cleveland	19.50
No. 2 foundry, Ironton	18.50 to 19.00
No. 2 foundry, Chicago	19.00
No. 2X foundry, Philadelphia	20.25 to 20.75
No. 2X foundry, N. J. tidewater	20.50 to 21.00
No. 2X foundry, Buffalo	19.00 to 19.50
No. 2 plain, Philadelphia	19.50 to 20.00
No. 2 plain, N. J. tidewater	20.00 to 20.50
No. 2 plain, Buffalo	18.75 to 19.00
No. 2 southern, Birmingham	15.00 to 15.50
No. 2 southern, Cincinnati	17.90 to 18.40
No. 2 southern, Chicago	19.50 to 20.00
No. 2 southern, Phila. delivery	20.00 to 20.50
No. 2 southern, Cleveland	19.00 to 19.50
No. 2 southern, New York docks	19.00 to 19.50
No. 2 southern, Boston docks	19.25 to 19.75
No. 2 south. interior, New Eng.	20.00 to 21.00
No. 2 southern, St. Louis	18.40 to 18.90
Virginia No. 2X, furnace	18.50
Virginia 2X, Philadelphia	21.25
Virginia 2X, Jersey City	21.00
Virginia 2X, Boston points	21.75
Gray forge, eastern Pa.	19.00 to 19.50
Gray forge, Pittsburgh	18.95
Gray forge, Birmingham	14.00 to 15.00
Silveries, 8 per cent, furnace	26.50 to 27.00
Silveries, 8 per cent, Chicago	29.50
Low phos. Standard, Phila.	33.00
Low phos. Lebanon, Pa.	30.00 to 32.00
Low phos. Pittsburgh	30.00 to 31.00
Charcoal, Lake Superior, Chgo., Nos. 1 to 4	19.75 to 22.25
Charcoal, Buffalo	21.00 to 22.00
Charcoal, Birmingham	23.00

IRON ORE

Lake Superior Ores.
(Lower Lake Ports.)

Old range Bessemer, 55 per cent, ton	$4.45
Mesabi Bessemer, 55 per cent, ton	4.20
Old range non-Bess., 51½ per cent, ton	3.70
Mesabi non-Bess., 51½ per cent, ton	3.55

Eastern Ores.
(Per unit delivered eastern Pennsylvania.)

Pt. Henry fur., 60 per cent, unit	8.5c to 8.9c
Local N. Y. and N. J. ores, unit	8.5c to 8.75c
Port Henry lump, at mines, ton	$4.00

Foreign Ores.
(Per unit Philadelphia.)
(Prices nominal.)

Foreign Bess., 50 to 65 per cent	8 to 8½
For'n non-Bess., 50 to 65 per cent	8 to 8½

COKE

(At the ovens.)

Connellsville furnace (nom.)	$2.50
Connellsville fur., contract	3.00
Connellsville foundry, contract	3.50 to 3.75
Connellsville foundry	4.00 to 4.25
Wise county furnace, contract	3.00 to 3.25
Wise county foundry, contract	3.50 to 3.75
Pocahontas foundry, contract	3.25 to 3.75
Pocahontas furnace, contract	3.00 to 3.25
New River, foundry contract	3.75 to 4.25
New River, furnace contract	3.25 to 3.50

FERRO ALLOYS AND STEEL MAKING METALS

Ferro manganese, 80 per cent, seaboard, prompt	$400 to 450
Ferro manganese, 80 per cent, seaboard, contract	175
Spiegel, 20 per cent, furnace, prompt and 2nd quarter	80.00 to 100.00
Spiegel, 20 per cent, fur., last half	60.00
Ferro-silicon, 50 per cent, Phila.	83.00 to 85.00
Ferro-silicon, 50 per cent, Pbgh.	83.00 to 85.00

Bessemer ferro-silicon, 9 per cent to 10 per cent, $30.00; 10 to 11 per cent, $31.00; 11 to 12 per cent, $32.00; 12 to 13 per cent, $33.00 a ton at the furnace at Ashland, Jackson and New Straitsville, O.

Ferro-chrome, nominal.

Ferro-vanadium, nominal, Pittsburgh.

Ferro-carbon titanium, 8 to 12½ cents per pound in carloads.

Nickel, nominal.

Ferro-tungsten, nominal.

Cobalt metal, nominal, Pittsburgh.

Aluminum, nominal, Pittsburgh.

Ferro-molybdenum, Pittsburgh, nominal.

Freight Rates via Panama Canal

Rates on finished materials, including plates, shapes, bars, wire, nails, etc., to Pacific coast points via Panama canal, per 100 lbs., in carload lots, exclusive for insurance and dockage.

From New York	$0.40
From Pittsburgh	.619
From Youngstown	.619
From Niles	.619
From Wheeling	.619
From Steubenville	.619
From Johnstown	.604
From Coatesville	.545
From Steelton	.555
From Bethlehem	.529
From Cleveland	.65
From Chicago	.765

SEMI-FINISHED MATERIAL

Open hearth billets, Phila.	$50.00 to 55.00
Forging billets, Phila.	60.00 to 65.00
Forging billets, Pbgh., nominal	55.00 to 65.00
Forging billets, Chgo	55.00 to 60.00
Wire rods, Pittsburgh (nom.)	55.00 to 60.00
Bessemer billets, Youngston	45.00 to 50.00
Bessemer billets, Pittsburgh	45.00 to 50.00
Open hearth billets, Pittsburgh	45.00 to 50.00
Open hearth billets, Youngstown	45.00 to 50.00
Bess. sheet bars, Youngstown	45.00 to 50.00
Op. h'th sheet bars, Youngstown	45.00 to 50.00
Bess. sheet bars, Pittsburgh	45.00 to 50.00
Open h'th sh. bars, Pbgh.	45.00 to 50.00
Muck bar, Pittsburgh (nominal)	40.00

SKELP

Grooved steel skelp	2.35c to 2.50c
Sheared steel skelp	2.60c

RAILS AND TRACK MATERIAL

Stand. Bess. rails, Pbgh. & Chg.	1.25c
Stan. op-h'th rails, Pbgh. & Chg.	1.34c
Light rails, 8 to 10 lbs., Pbgh.	2.25c
Light rails, 8 lb., Chgo.	1.85c
Light rails, 12 to 14 lbs., Pbgh.	2.20c
Light rails, 12 lbs., Chgo.	1.80c

Freight Rates, Pig Iron

Mahoning and Shenango valleys to:—	
Cleveland	$0.95
Newark, N. J.	2.98
Boston	3.18
Philadelphia	2.78
Pittsburgh	.95
St. Louis	3.18
Buffalo to:—	
Albany, N. Y.	$1.26
New England (all rail)	2.58
New York and Brooklyn (all rail)	2.58
New York and Brooklyn (by canal)	1.25 to 1.60
Virgnia furnaces to:—	...
Boston docks (r. and w.)	$3.05
New England (all rail)	3.25
New York dock (r. and w.)	2.88
Birmingham, Ala., to:—	
Cincinnati	$2.90
Chicago	4.00
Cleveland	4.00
Louisville, Ky.	2.65
New York (all rail)	6.15
New York (r. and w.)	4.25
Philadelphia (all rail)	5.20
Philadelphia (r. and w.)	4.00
Pittsburgh	4.90
Savannah, Ga.	2.75
Chicago to.—	
Des Moines	$2.80
Milwaukee	.50
Moline, Ill.	1.40
Omaha	3.58
St. Louis	1.58
Ironton and Jackson, O., to:—	
Chicago	$2.54
Cincinnati	1.26
Cleveland	1.62
Detroit	1.81
Indianapolis	1.58

Light rails, 16 to 20 lbs., Pbgh.	2.15c
Light rails, 16 to 20 lbs., Chgo.	1.75c
Light rails, 25 to 45 lbs., Pbgh.	2.10c
Light rails, 25 to 45 lbs., Chgo.	1.70c
Relaying rails, standard, Pbgh. and Chgo.	$23.00 to 24.00
Relaying rails, light, Chgo.	21.50 to 22.50
Angle bars, st. sect., Pbgh., base	1.50c to 1.75c
Angle bars, st. sections, Chgo.	1.50c to 1.75c
Spikes, railroad, Pbgh.	2.65c to 2.75c
Spikes, railroad, Chgo.	2.75c to 2.90c
Track bolts, Pbgh.	3.25c
Track bolts, Chgo.	3.25c to 3.50c
Tie plates, Chgo.	50.00 to 55.00

SHAPES, PLATES AND BARS

Structural shapes, Pbgh.	2.50c to 3.00c
Structural shapes, Pbgh. (con.)	2.50c to 2.75c
Structural shapes, Philadelphia	2.609c to 3.159c
Structural shapes, Chgo.	2.64c to 3.19c
Structural shapes, New York	2.669c to 3.169c
Struc. shapes, San Francisco	2.00c to 2.05c
Tank plates, Chgo.	2.94c to 3.39c
Tank plates, Pbgh. (con.)	2.60c to 3.00c
Tank plates, Pbgh.	3.00c to 4.00c
Tank plates, Philadelphia	2.909c to 3.659c
Tank plates, New York	2.919c to 3.699c
Bars, soft steel, Chgo.	2.64c to 3.19c
Bars, soft steel, Pbgh. (con.)	2.50c to 2.75c
Bars, solt steel, Pbgh.	2.50c to 3.00c
Bars, soft steel, New York	2.669c to 3.169c
Bars, soft steel, Phila.	2.509c to 3.159c
Hoops, carloads, Pbgh.	2.75c
Bands, Pittsburgh	2.50c
Shafting, Pbgh., contr. carloads	20 to 25 off
Bar iron, Chgo.	2.35c
Bar iron, Philadelphia	2.559c
Bar iron, New York	2.569c
Bar iron, Cleveland	2.25c
Bar iron, Pittsburgh	2.50c to 2.75c
Hard steel bars, Chgo.	2.35c to 2.50c

SHEETS AND TIN PLATE

No. 28, black Pittsburgh	2.90c to 3.00c
No. 28, black, Chicago	3.09c to 3.19c
No. 28, tin mill, black, Pbgh.	2.90c to 3.00c
No. 28, galvanized, Pbgh.	4.85c to 5.25c
No. 28, galvanized, Chgo.	5.19c
No. 10, blue anl'd, Pbgh.	3.00c to 3.10c
No. 10 blue anl'd, Pbgh.	3.409c to 3.909c
No. 10, blue anl'd, Chgo.	3.19c to 3.29c
Tin plate, 100 lb., coke base	$4.50

EXTRAS FOR SHEET OR TIN MILL SPECIFICATIONS

(Per hundred pounds.)

Single pickl'd, cold roll. and re-anld.	30 cents
Hot roll'd pickled and anl., tin mill.	25 cents
Full pickled, cold rolled and re-anld.	50 cents
Auto sheets	75 cents
Blue stove pipe stock	10 cents
Range steel	30 cents
Re-squaring	10 cents
Roller leveling	10 cents
Patent leveling and re-squaring	35 cents
Oiling sheets	10 cents
Deoxiding	10 cents
Lime finish	10 cents
Open-hearth stamping steel, free fr. mill scale	55 cents
Special open hearth deep stpg. steel, free from mill scale	80 cents
Extra deep special auto body stock.	1.25
Ext. for 28 gage ov. 32 to 36-in. wide	10 cents

No reduction for sheets not annealed.

The above extras apply on both sheet and tin mill specifications, at the same rate.

IRON AND STEEL PIPE

(Pittsburgh.)

	Black. Butt.-weld.	Galv. Butt.-weld.
Steel, ¾ to 3 inches	72	53½
Iron, ¾ to 1¼ inches	62	41
	Lap-weld.	
Steel, 2½ to 6 inches	71	52½

BOILER TUBES

Steel, 3½ to 4½ inches, l. c. l.	60
Iron, 3½ to 4½ inches, l. c. l.	48

WIRE PRODUCTS

(Retailers' price 5 cents above jobbers' quotations.)

Wire nails, jobbers', Pittsburgh	$2.40 to 2.50
Plain wire, jobbers', Pittsburgh	2.25 to 2.35
Galvaniged wire, jobbers', Pbgh.	2.95 to 3.05
Polished staples, Pbgh.	2.55 to 2.65
Galvanized staples, Pbgh.	3.25 to 3.35
Barb wire, painted, jobbers', Pbgh.	2.55 to 2.65
Barb wire, galv., jobbers', Pbgh.	3.25 to 3.35

IRON AND STEEL PRICES

Corrected up to Tuesday noon

BOLTS AND NUTS

(Delivered within 20-cent freight radius.)

Carriage bolts, ⅜ x 6 inches, smaller or shorter, rolled thread, 60 and 10, cut threads 60 and 5; larger or longer, 50.

Machine bolts with hot pressed nuts, ⅜ x 4 inches, smaller or shorter, rolled 60, 10 and 5; cut, 60 and 10; larger or longer, 50 and 10.

Cold pressed, semi-finished hexagon nuts, 75 and 10.

Gimlet and cone point lag bolts, 65. Hot pressed square, blank or tapped nuts, $3.25 off list; hot pressed hexagon blank or tapped, $3.25.

Cold pressed square, blank or tapped, $3.50 off; hexagon, blank or tapped, all sizes, $4.25.

RIVETS

Structural rivets, Pbgh	3.25c
Structural rivets, Chgo. delivery	3.30c
Boiler rivets, Pbgh	3.35c
Boiler rivets, Chgo. delivery	3.40c

STEEL SHEET PILING

(Pittsburgh.)

Base sizes	2.50c

STANDARD STEEL CHAIN

Chain, ⅜ inch proof coil	5.00c

COLD ROLLED STRIP STEEL

Base price 6.00c to 6.25c per 100 pounds, hard, coils 1½ inches and wider and by .100 inches and heavier.

Extra for Thickness.

0.100-inch and thicker	Base
0.050 to 0.099	$0.05
0.036 to 0.049	0.20
0.035	0.20
0.031 to 0.034	0.35
0.026 to 0.030	0.45
0.020 to 0.024	0.55
0.025	0.45
0.017 to 0.019	1.35
0.015 to 0.016	1.75
0.013 to 0.014	2.45
0.012	2.80
0.011	3.15
0.010	3.50

Other extras as per card of March 15, 1916.

CAST IRON WATER PIPE

Four-inch, Chicago	$33.50 to 34.00
Six-inch and larger, Chicago	30.50 to 31.00
Six-inch Class B, New York	30.50
Four-inch, Class B, New York	33.50
Four to six-inch, Birmingham	28.00
Six-inch and larger, Birmingham	25.00

Light weight water and gas pipe $1 per ton higher than standard water.

WAREHOUSE PRICES

Steel bars, Chicago	3.10c
Steel squares, 2-in. & ov., Cleve.	3.75c
Steel rounds, 2-in. & ov., Cleve.	3.75c
Steel bars, under 2 in., Cleveland	3.25c
Steel bars, Philadelphia	3.25c to 4.10c
Steel bars, New York	3.10c
Steel bars, St. Louis	3.15c
Steel bars, Cincinnati	3.20c to 3.75c
Steel bars, St. Paul	3.20c
Steel bars, over 2-inch, Buffalo	3.65c
Steel bars, Buffalo	2.95c
Iron bars, Chicago	2.30c
Iron bars, Cleveland	3.20c
Iron bars, St. Louis	2.75c
Iron bars, Cincinnati	3.20c to 3.75c
Iron bars, Philadelphia	3.25c
Iron bars, New York	3.10c
Shapes, Chgo.	3.10c
Shapes, St. Louis	3.15c
Shapes, St. Paul	3.20c
Shapes, New York	3.10c
Shapes, Cleveland	3.25c
Shapes, Philadelphia	3.25c
Shapes, Buffalo	2.95c
Shapes and plates, Cincinnati	3.20c to 3.50c
Plates, Chgo.	3.50c
Plates, St. Louis	3.55c
Plates, St. Paul	3.60c
Plates, New York	4.00c
Plates, Cleveland	3.65c
Plates, Philadelphia	4.00c
No. 10 blue anl. sheets, Chgo.	3.40c
No. 10 blue anl. sheets, Cleve.	3.50c
No. 10 blue anl. sheets, Buffalo	3.25c
No. 10 blue anl. sheets, St. Louis	3.45c
No. 10 blue anl. sheets, Cinci.	3.50c
No. 10 blue anl. sheets, St. Paul	3.50c
No. 28 black sheets, Chgo.	3.20c
No. 28 black sheets, Cleveland	2.95c
No. 28 black sheets, Cincinnati	3.95c
No. 28 black sheets, St. Louis	3.20c
No. 28 black sheets, St. Paul	3.35c
No. 28 galv. sheets, Chgo.	4.80c to 5.00c
No. 28 galv. sheets, Cleveland	5.25c
No. 28 galv. sheets, Cincinnati	5.65
No. 28 galv. sheets, St. Louis	5.25c to 5.50c

Freight Rates, Coke

Connellsville district, per 2,000 lbs., to:—	
Baltimore	$1.80
Buffalo	1.85
Chicago	2.50
Cleveland	1.60
Detroit	2.10
East St. Louis	2.80
Joliet	2.50
Louisville	2.50
Milwaukee	2.85
New York	2.85
Philadelphia	2.05
Pittsburgh	.75
Richmond, Va.	2.94
Toledo	1.85
Valley Furnaces	1.20
Cincinnati	2.00

IRON AND STEEL SCRAP

(Net Tons.)

Arch bars and transoms, Chgo.	$19.50 to 20.00
Angle bars, iron, Chicago	18.00 to 18.25
Angle bars, steel, St. Louis	15.50 to 16.00
Arch bars and transoms, St. L.	20.50 to 21.00
Cut forge, Chicago	15.75 to 16.25
Knuckles, coup., Chgo.	16.25 to 16.75
Springs, St. Louis	16.50 to 17.00
Springs, Chgo.	17.25 to 17.50
Knuckles, coup., St. L.	16.50 to 17.00
Locomotive tires, Chicago	18.50 to 19.00
Locomotive tires, St. Louis	18.50 to 19.00
Railroad wrought, No. 1, Chgo.	17.00 to 17.50
Railroad wrought, No. 1, Cleve.	18.00 to 18.50
Railroad wrought, No. 1, St. L.	17.50 to 18.00
Railroad wrought, No. 1, Cinci.	13.00 to 13.50
Railroad wrought, No. 2, Chgo.	15.75 to 16.75
Railroad wrought, No. 2, St. L.	17.00 to 17.50
Shafting, St. Louis	18.50 to 19.00
Steel car axles, Birmingham	19.00 to 20.00
Steel car axles, St. Louis	26.00 to 27.00
Steel car axles, Chicago	26.00 to 26.50

Freight Rates, Finished Material

From Pittsburgh, carloads, per 100 lbs. to:—	
New York	16.9 cents
Philadelphia	15.9 cents
Boston	18.9 cents
Buffalo	11.6 cents
Baltimore	15.4 cents
Cleveland	10.5 cents
Cincinnati	15.8 cents
Chicago	18.9 cents
Minneapolis and St. Paul	32.9 cents
Denver	68.6 cents
St. Louis	23.6 cents
New Orleans	30 cents
Birmingham	45 cents
Pacific coast (all rail)	73.9 cents
Pacific coast (tin plate)	70 cents
Pacific coast, via Panama canal	61.9 cents

Boiler plate, cut, No. 1 Chgo.	12.00 to 12.50
Boiler plate, cut, No. 1, St. L.	9.50 to 10.00
Boiler punchings, Chicago	14.00 to 14.50
Busheling, No. 1, Chicago	14.00 to 14.50
Busheling, No. 1, Cleveland	14.50 to 15.00
Busheling, No. 1, Cincinnati	10.75 to 11.25
Busheling, No. 1, St. Louis	13.50 to 14.00
Busheling, No. 2, Chicago	9.75 to 10.25
Bundled sheet, Cincinnati	8.75 to 9.25
Cast, No. 1, Cleveland	13.75 to 14.25
Cast, No. 1, Cincinnati	11.75 to 12.25
Cast, No. 1, St. Louis	14.50 to 15.00
Cast, No. 1, Chicago	13.50 to 14.00
Cast No. 1, Birmingham	11.50 to 12.00
Cast borings, Chicago	7.50 to 8.00
Cast borings, Cleveland	8.75 to 9.00
Cast borings, Cincinnati	7.75 to 8.25
Cast borings, St. Louis	7.50 to 8.00
Machine shop turnings, Chgo.	8.00 to 8.50
Machine shop turnings, Cleve.	8.75 to 9.00
Machine shop turnings, Cinci.	7.25 to 7.75
Machine shop turnings, St. L.	8.50 to 9.00
Malleable agricultural, Chgo.	12.00 to 12.50
Malleable agricultural, St. Louis.	14.00 to 14.50
Malleable railroad, Chicago	14.25 to 14.75
Malleable, Cincinnati	8.75 to 9.25
Malleable railroad, St. Louis	14.00 to 14.50
Pipes and flues, Cleve. (nom.)	13.00 to 13.75
Pipes and flues, Chicago	12.50 to 13.00
Pipes and flues, St. Louis	12.75 to 13.75
Stove plate, Chicago	11.50 to 12.00
Stove plate, Cleveland	10.25 to 10.75
Stove plate, Buffalo	11.50 to 12.00
Stove plate, Cincinnati	8.50 to 9.00
Stove plate, St. Louis	11.00 to 11.50
Stove plate, Birmingham	10.00 to 10.25

(Gross tons.)

Busheling, No. 1, Buffalo	15.00 to 15.50
Busheling, No. 1, Pbgh	15.00 to 15.50
Busheling, No. 2, Buffalo	12.00 to 12.50
Bundled sheets, Pittsburgh	15.00 to 15.25
Bundled sheets, Cleveland	12.75 to 13.25
Bundled sheet, Buffalo	13.00 to 13.50
Car wheels (iron), Pittsburgh	16.00
Car wheels (steel), Pittsburgh	18.00 to 18.50
Car wheels, Chicago	14.25 to 15.00
Car wheels, eastern Pa.	17.50 to 18.00
Car wheels, Buffalo	15.25 to 15.75
Car wheels, N. Y.	15.00 to 15.50
Car wheels, St. Louis	14.50 to 15.00
Car wheels, Birmingham	10.50 to 11.00
Cast borings, New York	9.00 to 9.50
Cast borings, eastern Pa.	11.50 to 12.00
Cast borings, Buffalo	9.25 to 9.75
Cast borings, Pittsburgh	11.50
Cast, No. 1, eastern Pa.	18.00 to 18.50
Cast, No. 1, Pittsburgh	16.50
Cast, heavy No. 1, N. J. points	18.00 to 18.25
Forge No. 1, eastern Pa.	16.00 to 16.50
Frogs, switches, guards, Chgo.	16.75 to 17.00
Frogs, switches, guards, St. L.	17.00 to 17.50
Grate bars, Buffalo	12.00 to 12.50
Grate bars, N. J. points	13.50 to 13.75
Heavy axle turnings, Buffalo	12.50 to 13.00
Heavy melting steel, Pbgh.	18.00 to 18.50
Heavy melting steel, Buffalo	18.00 to 18.50
Heavy melting steel, Chicago	16.75 to 17.00
Heavy melting steel, Cleveland	17.00 to 17.25
Heavy melting steel, Cincinnati	14.25 to 14.75
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